ELECTRONIC TECHNICIAN

Including
SERVICE
Magazine

STEREO
STEREO
1960

50¢

September • 1959

By Adding EV®

Super-Sonax Wide-Angle Tweeter you can

DRAMATICALLY IMPROVE

YOUR HIGH-FIDELITY SYSTEM

Only from the *widest-range reproduction* can you fully feel the emotional impact of sound reality. Simply by adding the E-V *Super-Sonax Tweeter* to your present speaker system, you extend high frequency response smoothly and efficiently beyond the last audible octaves . . . including the subtle overtones and delicate harmonics of the fundamentals of *all* the instruments in the large concert orchestra. What's more . . . the Super-Sonax is also your *first* step to the vibrant sound of true stereo in *your* living room.

ONLY E-V **gives you Sonophase* and Diffraction**

ONLY E-V **gives you all-important**

FUSION

FOR ALL-POSITION STEREO LISTENING

For enjoyment of *true stereo* without hole-in-the-middle, ping-pong, one-position listening, E-V *Super-Sonax* VHF *Tweeters* give all-important FUSION, by completely dispersing higher-frequencies throughout the room. This makes the significant stereo sounds from one speaker fuse with the sounds from the other speaker in varying and controlled proportions . . . gives proper depth and placement to the musical instruments simultaneously, without spatial distortions. You can feel free to sit anywhere in the room or move about for true stereo listening from any angle, without directing the speakers.

Flat-extended very-high-frequency response is made possible only with the exclusive E-V Sonophase* throat design. This assures the smooth, brilliant highs so necessary for blend and balance.

Wide-angle (180°) dispersion achieved through exclusive E-V Diffraction spreads the sound throughout the entire listening area smoothly and evenly.

Working together, these and other E-V features combine to assure accurately-proportioned direct and indirect widely dispersed stereo sound as in the original recorded spatial relationships. This is FUSION. This is *true high-fidelity stereo* as only *Electro-Voice* can bring it to you.

Get full advantage of *Super-Sonax* in the wide choice of complete E-V multi-way speaker systems—or add it on to your present system for improved reproduction, *on money-back guarantee.*

Model T350 Ultra-Sonax VHF Tweeter. For deluxe-efficiency systems. Has reserve power and extra sensitivity. Response to 21 kc. 1 lb. magnet. 16 ohms. Recommended crossover 3500 cps. Net, **$60**

Model T35 Super-Sonax VHF Tweeter. For medium-efficiency systems. Response to 19 kc. 1/2 lb. mag. 16 ohms. Recom. crossover 3500 cps. Net, **$35**

Model T35B Sonax VHF Tweeter. For lower-efficiency systems. Response to 18 kc. 1/4 lb. magnet. 16 ohms. Recommended crossover 3500 cps. Net, **$22**

The above tweeters are also available as Building Block kits complete with crossover, level control, and wiring harness, for only $15.00 more.

See Your E-V High-Fidelity Dealer or Write for Catalog No. 134 to Dept. 99-T

*No Finer
Choice than* **Electro-Voice®**

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September 1959

FRONT COVER Stereophonic sound has become a major factor in electronic home entertainment. Service technicians—the men who install and repair this equipment—will find the 64-page section STEREO 1960 of considerable interest. It contains technical articles, a directory and a product catalog, starting on page 85. STEREO 1960 table of contents is on page 87.

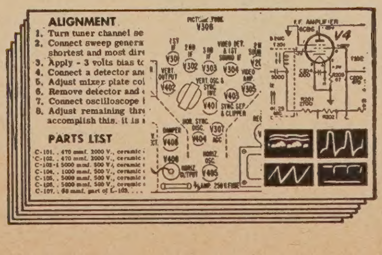
FEATURES AND ARTICLES

Service Dealers Play Vital Role in Stereo Sales. Stereo 1960. (Editorials) 35
"Tuning in the Picture" 36
Unloading the Flyback .... *Robert Cornell* 38
Servicing DX Communication Receivers .... *Leo G. Sands* 40
Statistical Analysis of the Electronic Industry .... *Frank Mansfield* 42
Modules for Electronics .... *Allan Lytel* 44
"Tough Dog Corner" .... *G. L. Frichette, M. G. Goldberg* 47
Servicing Home Vacuum Cleaners .... *E. A. Mueller* 50
Shop Hints .... *A. J. Krukowski* 54
Building a Technical Library 112
STEREO 1960 85-148

DEPARTMENTS

Letters to the Editor 6
Editor's Memo 12
News of the Industry 16
Audio News Letter 25
Reps. & Distrs. 32
Calendar of Coming Events 37
New Books 65
New Products 70
Association News 78
Catalogs & Bulletins 81

CIRCUIT DIGESTS 149



IN THIS ISSUE

(16 pp. latest schematics—see last page)

ADMIRAL: TV Chassis 16X1, 16AX1

PACKARD-BELL: TV Chassis V8-3

PHILCO: TV Chassis 10L60, 10L60U, 10L60R, 10L60UR

RCA: TV Chassis 128A, B, C, E, F, H, J, M, U, AA, AB

ZENITH: Record Changer Model S-14094

STARRING
DAVE GARROWAY
in NBC-TV's
"Today" Show

CHANNEL MASTER®

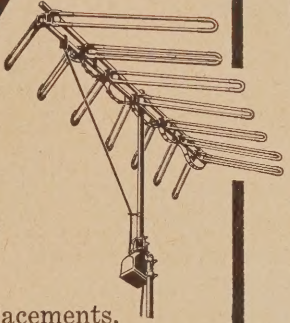
Channel Master is telling the T-W story to almost every family in the United States with the MOST SPECTACULAR ANTENNA PROMOTION OF ALL TIME!

STARRING
JOHN PAINE
in ABC-TV's
"The Restless Gun"

STARRING
GALE STORM
in ABC-TV's
"The Gale Storm Show"

STARRING
BOB CUMMINGS
in ABC-TV's
"Love That Bob"

the STARS ★ are out FOR THE T-W



THE BEST OF ANTENNAS DELIVERS THIS BEST OF PROMOTIONS!

To help you sell more antenna replacements, Channel Master commercials will be broadcast from coast to coast by 4 of America's most popular TV shows over the entire NBC and ABC networks—210 TV stations.

In addition to this full network coverage, 2 powerful national magazine campaigns will put the T-W story into 17 million homes...many of them right in your community.

These ads are aimed at telling consumers that their antenna installations are becoming old, worn out, obsolete, and that for the best possible TV reception they should replace their antennas with the T-W. This campaign has been designed to create new business for you by making the TV family T-W conscious.

ONLY CHANNEL MASTER GIVES THE DEALER THIS KIND OF SUPPORT!

2 NATIONAL TELEVISION NETWORKS!

★ ★ ★ ★ ★

4 TOP-RATED TV SHOWS!

★ ★ ★ ★ ★

8 WEEKS OF STAR-STUDDED PROMOTION!

PLUS

2 HARD-HITTING NATIONAL MAGAZINE CAMPAIGNS!

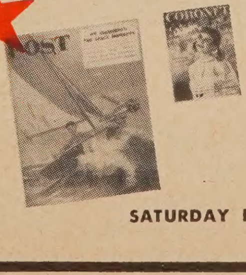
★ FARM MAGAZINES

Successful Farming
Progressive Farmer
Farm Journal

To reach the rural market ...where the big fringe installations are sold!

FARM JOURNAL
SUCCESSFUL FARMING
PROGRESSIVE FARMER

★ GENERAL MAGAZINES



To reach the vast readership of these widely-read publications...in every city and hamlet in the country!

SATURDAY EVENING POST • CORONET

Now meet the real star of the show...

The CHANNEL MASTER® T-W

★ STAR ★ of Rooftop America!

Three years ago, Channel Master developed the Traveling Wave antenna. This breakthrough in antenna design was so revolutionary...so far ahead of its time...that modern science has not yet been able to produce a comparable antenna.

Here's why other antennas simply cannot equal the powerful performance of the Traveling Wave.

The T-W antenna, featuring the Traveling Wave principle, looks and operates differently from other antennas. All but one of its elements are driven. No conventional dipoles are used—only "hairpin" or "fat" dipoles, and a revolutionary new Controlled Impedance Dipole. The 2-stage phasing harness...the critical lengths and angles of the elements...the folded reflector ... all combine to deliver these unique Traveling Wave advantages:

- Ideal phase relationships on **all** channels
- Optimum impedance on **all** channels
- Equal flow of current in all dipoles on **all** channels
- Fullest use of transmitted energy on **all** channels

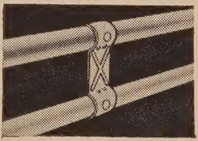
As a result, the T-W brings your set miles closer to the TV transmitter, providing the highest gains and highest front-to-back ratios ever achieved in a broad-band antenna.

★ ★ ★ ★ ★

The T-W is the stand-up-and-take-it antenna!

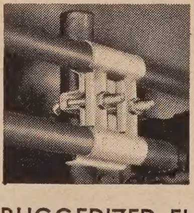
The T-W is as rugged as it looks. When you install the T-W, you know this hefty performer is up to stay. It is, without a doubt, the strongest antenna ever built. Here's why:

"TWIN TRUSS" CONSTRUCTION



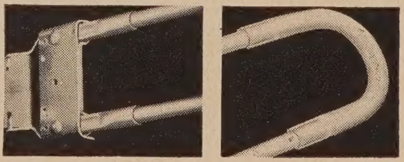
All elements and crossarm are made with "twin truss" design. The truss is a basic construction form used in bridges, airplane wings, and wherever high strength and light weight are required. This "twin truss" design makes each T-W element more than 5 times stronger than an ordinary dipole in its ability to withstand the heaviest wind and ice loads.

RUGGEDIZED MAST BRACKET



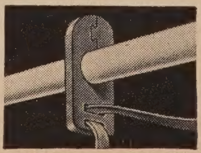
Heavy-duty U-bolt grips the antenna to the mast. Twist-proof construction. 4 rivets secure the bracket to the mast.

RUGGEDIZED ELEMENTS



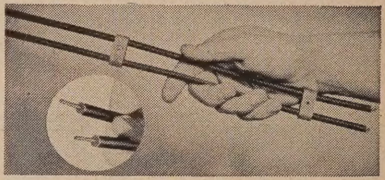
Seamless 1/2" dia. sleeves, seamless 1/2" dia. U-bend...20% heavier wall thickness than regular antenna construction.

"LINE-LOK"



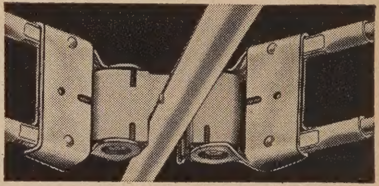
Absorbs all transmission line tension. Can't tear at terminals.

WEATHERPROOF HARNESS



Extra-thick 1/4" virgin polyethylene insulation protects impedance and electrical efficiency against salt air, rain, and ice.

MASSIVE, HEAVY DUTY INSULATOR MOLDINGS



★ ★ ★ ★ ★

The T-W has consumer recognition and acceptance!

Millions of consumers, including those in your own area, recognize and ask for the Channel Master brand name. Continuous full-scale advertising campaigns, local advertising, newspaper mats, window displays, streamers, and other advertising aids have made the American consumer T-W conscious. The Channel Master T-W out-sells, out-performs, out-lasts every other all-channel antenna. That's why this premium quality product is still the star of rooftop America...and a most profitable experience on the part of the dealer and the consumer alike.

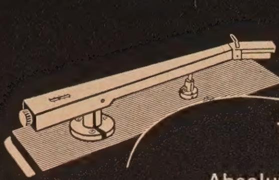
Call Your Channel Master Distributor Today!

CHANNEL MASTER CORP. ELLENVILLE, N. Y.

®-Trade Mark Reg. U.S. Pat.-Off.

CHANNEL MASTER

challenges you to Compare this new Professional Turntable (at $64.95) with any other turntable (at any price up to $119)

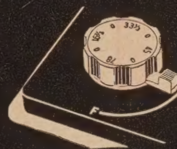


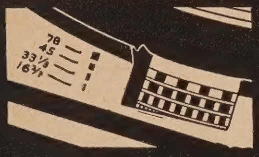
Stereo Transcription arm included

Absolutely non-resonant; mounted on friction free bearings. Plug-in head accommodates all popular stereo and monaural cartridges. Stylus pressure easily adjusted with micrometer precision.

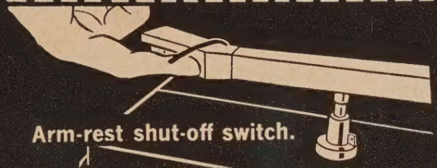
Plays all 4 speeds:

16-2/3
33-1/3
45
78





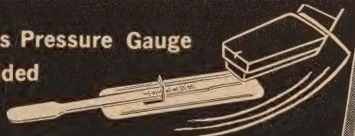
Built-in, illuminated, oversized strobe for all speeds. Vernier speed control.

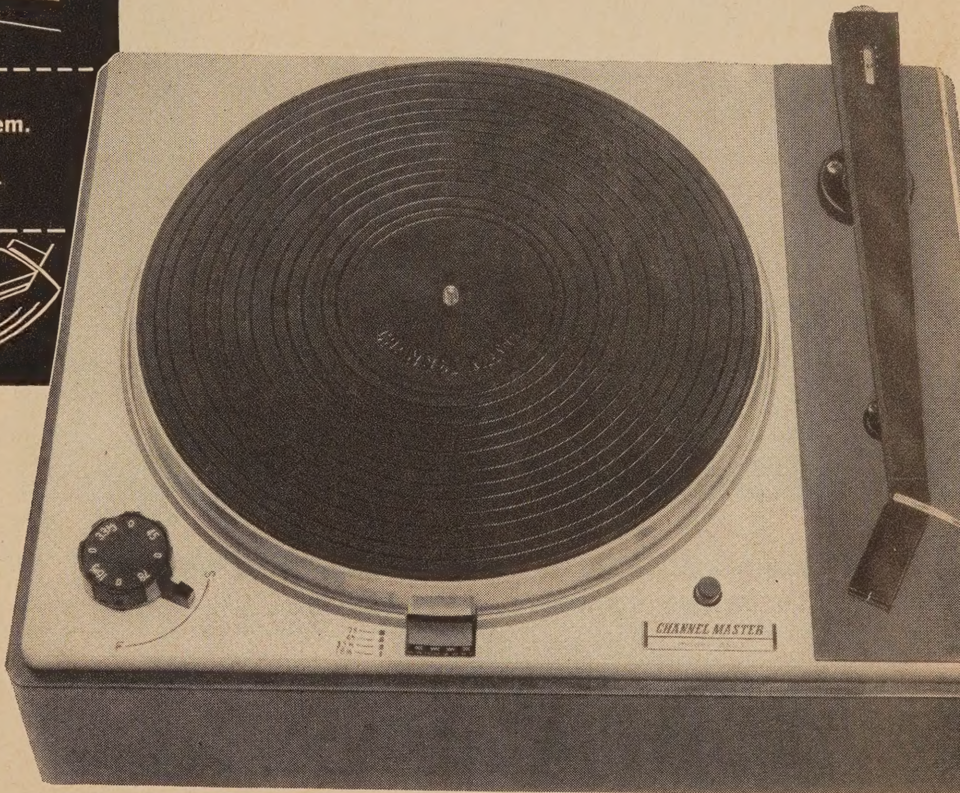


Arm-rest shut-off switch.

Advanced suspension system. Operates in electrical and mechanical silence.

Stylus Pressure Gauge included





Model 6652, without base, **$64.95** audiophile net

Model 6653, with furniture-finished mahogany base, factory wired plugs and jacks, **$79.95** audiophile net

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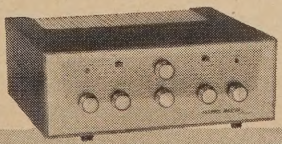
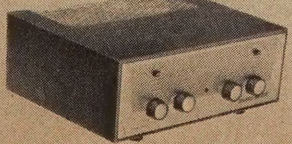
A.

B.



Channel Master offers you a full line of today's finest matched stereo components.

C.



D.

- **A.** Patented Minstrel Speaker System Series **6630** $29.95 audiophile net
- **B.** Dual 16 Watt Stereo Amplifier Model No. **6600** $99.95 audiophile net
- **C.** 20 Watt Monaural Amplifier Model No. **6620** $79.95 audiophile net
- **D.** AM/FM Tuner Model No. **6610** $84.95 audiophile net

THERE'S GOLD IN THIS C-D TREASURE CHEST
CORNELL - DUBILIER
CORNELL - DUBILIER
CONSISTENTLY
DEPENDABLE
"Preferred"
Capacitors

The modern way to stock and sell the world's most wanted capacitors. This efficient shop-chest tells you what's in stock and exactly where it is. No more digging for misplaced units. You get an assortment of the most popular C-D "Preferred" type twist-prongs, "Blue Beavers," and Mylar Tubulars—in handsome metal cabinets. Makes you look more efficient...makes work efficient! Best of all they're FREE with your purchase of capacitors.

See the "Treasure Chest" at your C-D distributor or write for Bulletins to Cornell-Dubilier Electric Corporation, South Plainfield, N.J.

Consistently Dependable
CORNELL-DUBILIER
SERVICE CAPACITORS

LETTERS
To the Editor

AM Sweep Generator

Editor, ELECTRONIC TECHNICIAN:

The article by Jack Darr, "Sweep Alignment For AM Radio" [July 1959], was excellent and I say all present-day AM radios should be visually aligned—but who manufactures an FM generator that goes down to 260 kc?

RAY LOEWEN
Ray's TV & Radio Shop,
Inola, Okla.

. . . I agree with the article but have not been able to find a sweep generator on the market that has the proper frequency for AM work.

KENNETH J. MILLER
Hartford, Conn.

. . . Could you inform me where I could purchase or get information about the kc sweep generator mentioned in the article?

J. ARTHUR RAGSDALE
Ragsdale TV,
San Francisco, Calif.

● *Practically all manufacturers who used to have such an instrument discontinued it sometime ago. However, the Hickok 288X FM-AM Alignment Generator is still available. It covers 1 kc to 160 mc frequency modulated—Ed.*

Transistor Testing

Editor, ELECTRONIC TECHNICIAN:

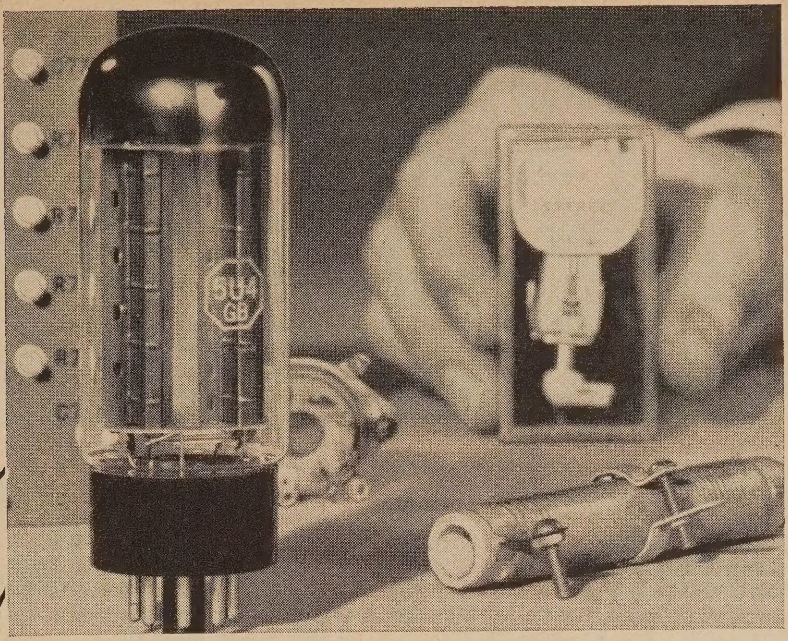
"Practical Transistor Testing" by Robert Middleton [July 1959] held considerable interest for me. However, I had some difficulty in reconciling the procedures given with the accompanying diagrams. Can you straighten me out on the following:

Fig. 1 shows the forward resistance between emitter and collector as *low.* The text states, "When the ohmmeter indicates forward resistance the *positive* lead is connected to the emitter terminal in a PNP transistor." In Fig. 2 the battery is connected between B and E. The text indicates that C and E are reversed. Also, the last sentence of the third paragraph states, "a 2 ma meter is suitable." Further on, it is suggested that the bias pot be adjusted between 20 and 50 ma. Is something wrong here?

B. W. VANORSDALE
Hot Springs, Calif.

● *There sure is something wrong. Our apologies. Fig. 1, emitter and collector polarities should be reversed; Fig. 2, reverse battery and ohmmeter leads so battery is between base and collector. The text should also be corrected to read, "Adjust the bias pot for a current reading between 20 and 50 μa," rather than ma.—Ed.*

(Continued on page 10)



Now you can be sure he'll get his tuner sooner...

SHIP BY GREYHOUND® PACKAGE EXPRESS

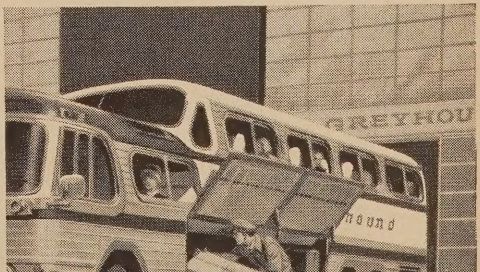
IT'S THERE IN HOURS... AND COSTS YOU LESS!

24 HOUR SERVICE...7 DAYS A WEEK... HOLIDAYS TOO!

Your packages go anywhere Greyhound goes...and Greyhound goes over a million miles a day! That means faster, more direct service to more areas, including many places not reached by other public transportation.

Packages get the same care as Greyhound passengers...riding on dependable Greyhound buses on their regular runs. And you can send C.O.D., Collect, Prepaid—or open a Charge Account.

Call your nearest Greyhound bus station or write to Greyhound, Dept. H9, 5600 Jarvis Ave., Chicago, Ill.



IRC CARBON COMPOSITION RESISTOR HANDY-PAKS ARE TAKING AMERICA BY STORM!

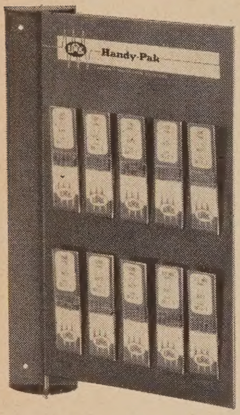
NOW this exciting

IRC®

HANDY-

is ready to keep

NEW!



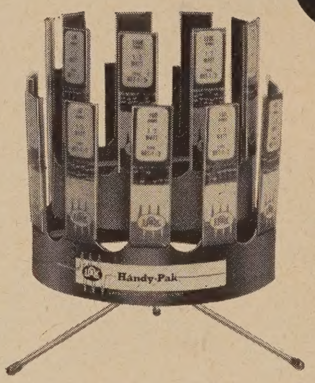
RESIST-O-PANEL

Easy-to-select, easy-to-inventory swing panel takes no bench space at all!

Wonderful space saver! Visible resistor stock on handy swing panel attaches to wall . . . can be used singly or in sets. All-metal—7″ wide x 12¼″ high—slotted to hold Handy-Paks—wall brackets included. Contains the 10 most popular resistor values, with room for 10 more Handy-Paks on back of panel. FREE with any of 4 popular assortments.

		Dealer Net
Assortment # 64	60 ½-watt, 10% resistors, 10 values.	$7.20
Assortment # 68	40 1 -watt, 10% resistors, 10 values.	7.20
Assortment # 72	60 ½-watt, 5% resistors, 10 values.	14.40
Assortment # 76	40 1 -watt, 5% resistors, 10 values.	14.40

NEW!



RESIST-O-ROUND

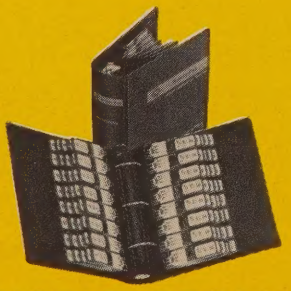
Unique revolving stock kit keeps IRC Handy-Paks at your fingertips!

Instant visual inventory within easy reach . . . in minimum bench space. Two tiers of Handy-Paks spin at the flick of a finger for fast, easy selection. This revolutionary metal kit is only 7″ diameter, 6¼″ high. Includes the 20 most popular resistor values. FREE with any of 4 assortments.

		Dealer Net
Assortment # 65	120 ½-watt, 10% resistors, 20 values.	$14.40
Assortment # 69	80 1 -watt, 10% resistors, 20 values.	14.40
Assortment # 73	120 ½-watt, 5% resistors, 20 values.	28.80
Assortment # 77	80 1 -watt, 5% resistors, 20 values.	28.80

MORE IRC HANDY-PAK STOCKERS FAVORED BY SERVICEMEN EVERYWHERE

Included FREE with any of 5 Handy-Pak stock assortments.



IRC RESIST-O-PEDIA

Attractive hardback binder has 3-ring "fingered" inserts for Handy-Paks. Indexed stock saves searching . . . speeds servicing. Identification always visible. 9″ x 8¼″ x 2⅞″. Five popular assortments.

Assort. No.	No. of Resistors	Wattage	No. of Values	Tolerance	Dealer Net
44	462	½	77	10%	$55.44
48	308	1	77	10%	55.44
51	195	2	65	10%	46.80
59	462	½	77	5%	110.88
63	308	1	77	5%	110.88

FREE with any of 4 assortments.

IRC RESIST-O-CHEST ▶

Ends "cigar box confusion". All-metal covered file in 10 Handy-Pak assortments. Compact 5⅝″ x 3⅜″ x 6¼″ size . . . takes little bench space. Identification clearly visible.

Assort. No.	No. of Resistors	Wattage	No. of Values	Tolerance	Dealer Net
42	204	½	34	10%	$24.48
43	462	½	77	10%	55.44
46	136	1	34	10%	24.48
47	308	1	77	10%	55.44
49	102	2	34	10%	24.48
50	195	2	65	10%	46.80
57	204	½	34	5%	48.96
58	462	½	77	5%	110.88
61	136	1	34	5%	48.96
62	308	1	77	5%	110.88

Include FREE wi any of thes 10 assortment

◀ IRC RESIST-O-CADDY

Ideal for in-home servicing. Plastic pouch folds to 6¾″ x 3⅞″ x 1½″ . . . fits in tube caddy or tool chest. Individual Handy-Pak pockets.

Assort. No.	No. of Resistors	Wattage	No. of Values	Tolerance	Dealer Net
41	120	½	20	10%	$14.40
45	80	1	20	10%	14.40
56	120	½	20	5%	28.80
60	80	1	20	5%	28.80

uartet of brand new

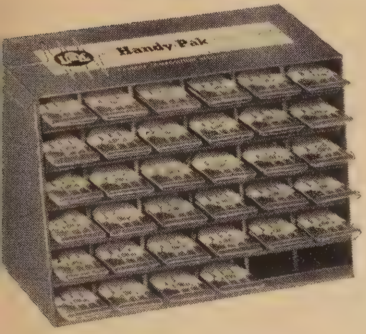
PAK* RESISTOR KITS

our resistor stocks at your fingertips

*Patent Pending

NEW!

RESIST-O-BIN



Easy-to-use
IRC
Handy-Pak
Stocker
with 36
identified
compartments!

st what busy servicemen need for compact, convenient stocking Handy-Paks. 36 compartments in recessed tiers are identified r easy access to resistors . . . and quick, accurate inventory. l-metal—6¾" wide x 4¼" deep x 4½" high. FREE with any 4 assortments.

		Dealer Net
sortment #66	204 ½-watt, 10% resistors, 34 values.......	$24.48
sortment #70	136 1 -watt, 10% resistors, 34 values.......	24.48
sortment #74	204 ½-watt, 5% resistors, 34 values.......	48.96
sortment #78	136 1 -watt, 5% resistors, 34 values.......	48.96

NEW!

RESIST-O-RACK

IRC
Handy-Pak
CARBON COMPOSITION RESISTORS

Orderly, neat
IRC
Handy-Pak
file for
complete stocks
of resistors!

The perfect answer to maintaining an orderly, complete inventory of Handy-Paks. Individual compartments separate stock by resistance values . . . with identification always visible. Metal rack is 11¾" wide x 5½" deep x 8" high. Key-hole slotted for wall mounting, if desired. FREE with any of 4 assortments.

		Dealer Net
Assortment #67	462 ½-watt, 10% resistors, 77 values.......	$55.44
Assortment #71	308 1 -watt, 10% resistors, 77 values.......	55.44
Assortment #75	462 ½-watt, 5% resistors, 77 values.......	110.88
Assortment #79	308 1 -watt, 5% resistors, 77 values.......	110.88

4.7 MEG OHMS 1 WATT TYPE GBT-1
47K OHMS 1/2 WATT TYPE GBT-1/2
4.7 MEG OHMS 2 WATTS TYPE BTB
IRC

IRC HANDY-PAKS

Smartest idea yet for packaging carbon composition resistors!

3 TYPES
½ watt, 1 watt and 2 watts*

10% tolerance **72¢ ea.**
5% tolerance **$1.44 each**
Dealer Net

Each IRC Handy-Pak contains several carbon composition resistors of one type and resistance value . . . to save you unnecessary shopping. Three types include: 6 ½-watt resistors; 4 1-watt resistors; 3 2-watt resistors.

Servicemen from coast to coast praise IRC Handy-Paks as the neatest, most compact, most convenient resistor package in the industry. Resistance value and power rating are clearly visible on every Handy-Pak. They're handier to use . . . open at either end; close to hold remaining resistors. IRC Handy-Paks keep leads straight; resistors are always factory-clean.

Choose the Handy-Pak deal that suits you best!

Order today from your
IRC Distributor!

IRC ®

INTERNATIONAL RESISTANCE CO.
414 N. 13th St., Philadelphia 8, Pa.
In Canada: International Resistance Co., Ltd.

"Far better than advertised"

...so say Miracle distributors, Miracle dealers and Miracle users!

MIRACLE MODEL TM-78

We said MIRACLES are unsurpassed, they say MIRACLES are unequalled

Only four months since the new Miracle Antenna with marvelous Miracle Reflector System was first dealer-sold and dealer-tested . . . and already dozens of wires, calls and letters have been received stating that the Miracle far surpasses the claims made in Miracle advertising.

By wire from a Distributor in Illinois — "Front to Back Ratio highest of any antenna ever sold or tested by us".

By phone from a dealer in Georgia — "After testing Miracle TM-78 with two other popular makes, we are discontinuing (Blank) line and will sell only Miracles in the future".

By letter from a user in Ohio — "Miracles are terrific! Your descriptive literature does not do full justice to model TM-57. It's a wonderful antenna . . . all our friends now envy our picture".

Such unsolicited and unbiased testimony is your assurance of Super Satisfaction when you, too, change to Miracles. Miracles are destined to become America's greatest seller, so be fair to yourself and to your future customers by investigating the Miracle Line of Antennas at once. Write, wire or phone collect for full particulars. Do it now, today . . . you'll always be glad you did!

THE TENNA MANUFACTURING CO. • CLEVELAND 25, OHIO
PHONE VULCAN 3-8080

(Continued from page 6)

Electronic Larynx

Editor, ELECTRONIC TECHNICIAN:

Could you furnish us with information regarding the instrument in your June 1959 issue that enables voiceless people to talk? Gilbert Wright and Kett Engineering are listed as developing it, but we can't find their address.

I. L. WILSON
Wilson Electric Service
Chariton, Iowa

● *The address of Kett Engineering Corp. is Santa Monica, Calif. Also,* ELECTRONIC TECHNICIAN'S *August 1959 issue contains an article describing an electronic larynx developed by Bell Telephone Labs., 436 West St., New York 14, N.Y.—Ed.*

Two-Color TV

Editor, ELECTRONIC TECHNICIAN:

Your "Editor's Memo" in the June 1959 issue gives a good summary of Dr. Land's recent experiments, but it may have left your readers with a wrong opinion of scientists in the field of color research. The two-color effect was published in 1895. A large number of two-color processes were patented and used in the first quarter of this century. The January 1940 issue of *The Journal of the Optical Society of America* presented formulas predicting the colors perceived in two-color displays. The capable scientists who developed the present method of broadcasting color TV were not ignorant of the science of color, nor of the capabilities and limitations of the two-color approach. While it is true that object colors of all hues may be produced in a picture made up of combinations of two colors and also reproduce original scenes containing these colors surprisingly well, it does not follow that all scenes can be so reproduced. On the contrary, scenes showing reasonably complete samples of the triple manifold of perceived object colors must necessarily include pairs of object colors very different in color that will be rendered alike by the method publicized by Land. The decision not to be satisfied with two-color TV has this very sound basis.

C. S. MCCAMY, Chief
Photographic Technology Section
National Bureau of Standards
Washington, D. C.

Radio Manufacturer

Editor, ELECTRONIC TECHNICIAN:

Can you help us out with the manufacturer's name of the old Spartan radio sets?

CHARLES H. MEREDITH
Radio Sales & Service
Cutchogue, L.I., N.Y.

● *This company was purchased by Magnavox Co., 2131 Bueter Rd., Fort Wayne 4, Ind.—Ed.*

sign up now

Raytheon announces a powerful new program for quality independent service dealers

Finally, one company, Raytheon, gives you the kind of program you've asked for — the *new* Raytheon Bonded Dealer Program. It's the logical way for *quality independent dealers* to supplement and strengthen their own promotional activities. It's the plan that builds customer confidence in *your* service, that builds repeat business for *you.*

Raytheon's ALL-STAR sales team will work for you all year 'round, telling families in your area about your Bonded Service. Join the Raytheon Bonded Dealer Program now, as *your* answer to increased profit.

Here's what you get: Free 90-day Repair Bonds • Complete local back-up program • National ads with Dealer Listings • Free merchandising kit

RAYTHEON
BONDED
TV-RADIO SERVICE

Mail this coupon today

Mr. William Grey, Dept. 221
Raytheon Company, 55 Chapel St., Newton 58, Mass.

Yes—I'm interested in taking part in the nationally advertised Raytheon Bonded Dealer Program. I understand that there are no dues or fees involved. I am a full-time, independent TV-Radio service dealer.

Firm Name: ______

Business Address: ______

City: ______ Zone: ______ State: ______

Telephone No.: ______

Your Signature and Title: ______

FIRST TIME . . . a versatile

DUAL HEAT SOLDERING GUN

FOR ONLY $7.95 LIST Model 8200K

. . . and best of all, it's a new Weller®

Here from Weller, long time leader in the soldering field, is the newest and finest soldering gun value on the market.

WELLER DUAL HEAT FEATURE saves time, gives greater convenience and greatly increases tip life. A touch of your finger on the Triggermatic control switches heat to high (125 watts) or low (90 watts) as your job requires. It adapts instantly to varying needs, and you use high heat only when necessary.

HIGH EFFICIENCY WELLERTIP utilizes copper for superior heat transfer and soldering efficiency, plus iron plating for durability. Flat cross-section design gives added strength and rigidity.

NEWEST DESIGN with sturdy plastic housing that resists hard knocks. Compact "feel" and comfortable balance aid precision soldering. Like all other Weller guns, this new model features instant heat, and a spotlight illuminates your work.

NEW!
Weller
Expert SOLDERING GUN KIT
INSTANT HEAT
DUAL HEAT
SPOTLIGHT
KESTER SOLDER
Weller EXPERT DUAL HEAT SOLDERING GUN KIT

KIT INCLUDED

In addition to the Dual Heat Soldering Gun you get:

- **Wire Bristle Cleaning Brush**
- **Soldering Aid for opening old joints, twisting wires**
- **All-purpose Solder**

On sale now at your Electronic Parts Distributor

WELLER ELECTRIC CORP. • 601 Stone's Crossing Rd., Easton, Pa.

Editor's Memo

It's so difficult for people to change their ways. There's habit. And inertia. And security in doing the same thing today that you did yesterday. After all, aren't you still around today?

Some folks think that making a major change is an admission of previous failure. To me it represents the honesty and courage to appraise a situation for what it's worth, and to take the necessary action to make improvements.

In business, there is an odd philosophy that motivates against change. When business is bad, people are desperate. The immediate problem is to keep your head above water. Who can stop to think of making changes?

On the other hand, when business is booming, who worries about doing things differently? Go argue with success!

As the saying goes, If You Can Keep Calm While Those About You Are Losing Their Heads, Maybe You Don't Understand The Situation.

There is the current case of a large manufacturer who makes a TV replacement product. This company has a somewhat elusive technical story to tell, but has decided to ignore the technician and tell it to the public in the fond hope that consumers will demand that technicians use the product. Have *you* had many customers insist on a particular brand after you fixed a set?

Service dealers are frequently loathe to make changes. I recall speaking to one fellow about the potential in audio work, home hi-fi installations, public address, intercoms, etc. His reply went something like this: "I'm making a decent living with TV. Why knock myself out?"

Business is almost a living thing, and the healthy business keeps growing.

To the stand-patters who are reluctant to change and improve, I'd like to relate this golf story about a duffer whose ball landed in a sand trap in the midst of a huge ant colony.

The man took a mighty swing, blasting a load of sand and a thousand ants in front of the ball. Again and again he hacked away, futilely spewing the ant colony in all directions. Finally, there were only two ants left. They looked about at the desolation that had once been the home of thousands of their brothers. The golfer was about to take another swing.

"Sam," one ant said to the other, "if you and I are going to survive—we'd better get on the ball!"

Al Forman

after routing, clip and save

a continuing series on technical topics
relating to electronic applications

Folio 59-6

REFERENCE DATA FILE

SANGAMO

the significance of envelope delay in communication networks . . .

The design of electronic wave filters is an exact science requiring painstaking attention to even the most minute detail. Of no less importance is the preparation of filter performance specifications. The transmission of pulsed sinusoids, steep-front modulation envelopes and other complex wave forms in modern telemetry, speech and facsimile systems has made the preparation of adequate component specifications an absolute necessity. The omission of a single required performance detail can lead to serious malfunctioning of the component in the completed system.

Envelope delay is one of the important characteristics in filter applications requiring minimum distortion of the transmitted signal. The systems engineer must give proper attention to this requirement. Mathematically, envelope delay may be defined as:

$$T_d = -\frac{d\beta}{d\omega}$$

Where: T_d = envelope delay in seconds
β = phase shift in radians
ω = angular frequency in radians per second

To hold distortion to a minimum, the envelope delay must be nearly constant over the entire frequency spectrum of the transmitted signal. It is the constancy of envelope delay rather than the actual magnitude of the delay which governs a network's ability to transmit a complex wave form without introducing objectionable distortion. The distortion arising from non-constant envelope delay is termed envelope delay distortion. From the above equation it is apparent that T_d is constant as long as phase shift varies linearly with frequency. Unfortunately, the realization of a filter network with perfectly linear phase shift over its entire pass band is not always practical or even possible. For this reason, the systems engineer should carefully evaluate the degree of constancy of T_d which his system requires as well as the range of frequencies over which T_d must be maintained nearly constant.

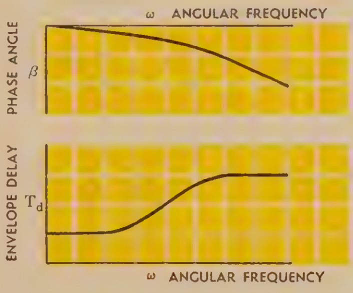


FIG. I *Illustrates the relationship between phase shift and envelope delay.*

The effect of envelope delay distortion on a transmitted signal is illustrated in figure 2. Figure 2 (a) shows the input signal. It is composed of a fundamental frequency plus the third and fifth harmonics. Figure 2 (b) shows the output signal. The network has shifted the fundamental frequency by 45°, the third harmonic by 90° and the fifth harmonic by 180°. The net result of such non-linear phase shift is a highly distorted output signal. If components of the wave had been shifted 45°, 135° and 225° respectively, the signal would have been transmitted without distortion.

FIG. II (a)

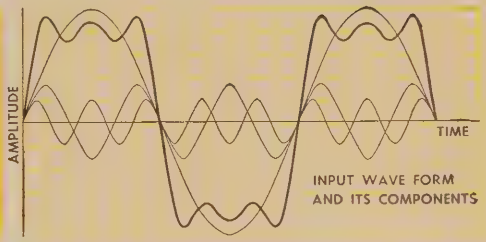
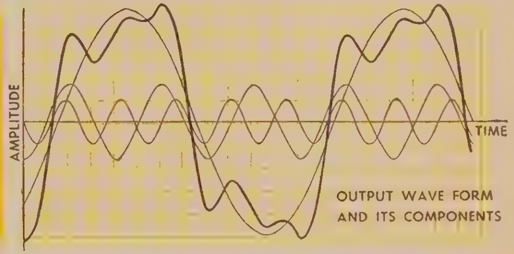


FIG. II (b)



Since envelope delay is defined as the derivitive of phase with respect to frequency, exact measurement of envelope delay is difficult. In practice, however, envelope delay may be approximated by the following definition:

$$T_{\Delta d} = -\left(\frac{\Theta_2 - \Theta_1}{f_2 - f_1}\right)\frac{1}{360}$$

Where: Θ_2 = phase angle in degrees at f_2

Θ_1 = phase angle in degrees at f_1

f_2 = frequency in cycles per second at which phase shift equals Θ_2

f_1 = frequency in cycles per second at which phase shift equals Θ_1

$T_{\Delta d}$ is the average envelope delay between f_2 and f_1. By convention, $T_{\Delta d}$ is assumed to be the envelope delay at a frequency equal to ½ $(f_1 + f_2)$. When the approximate formula is used to calculate envelope delay from empirical phase shift versus frequency data, it should be remembered that the approximation holds only for small differences between f_1 and f_2.

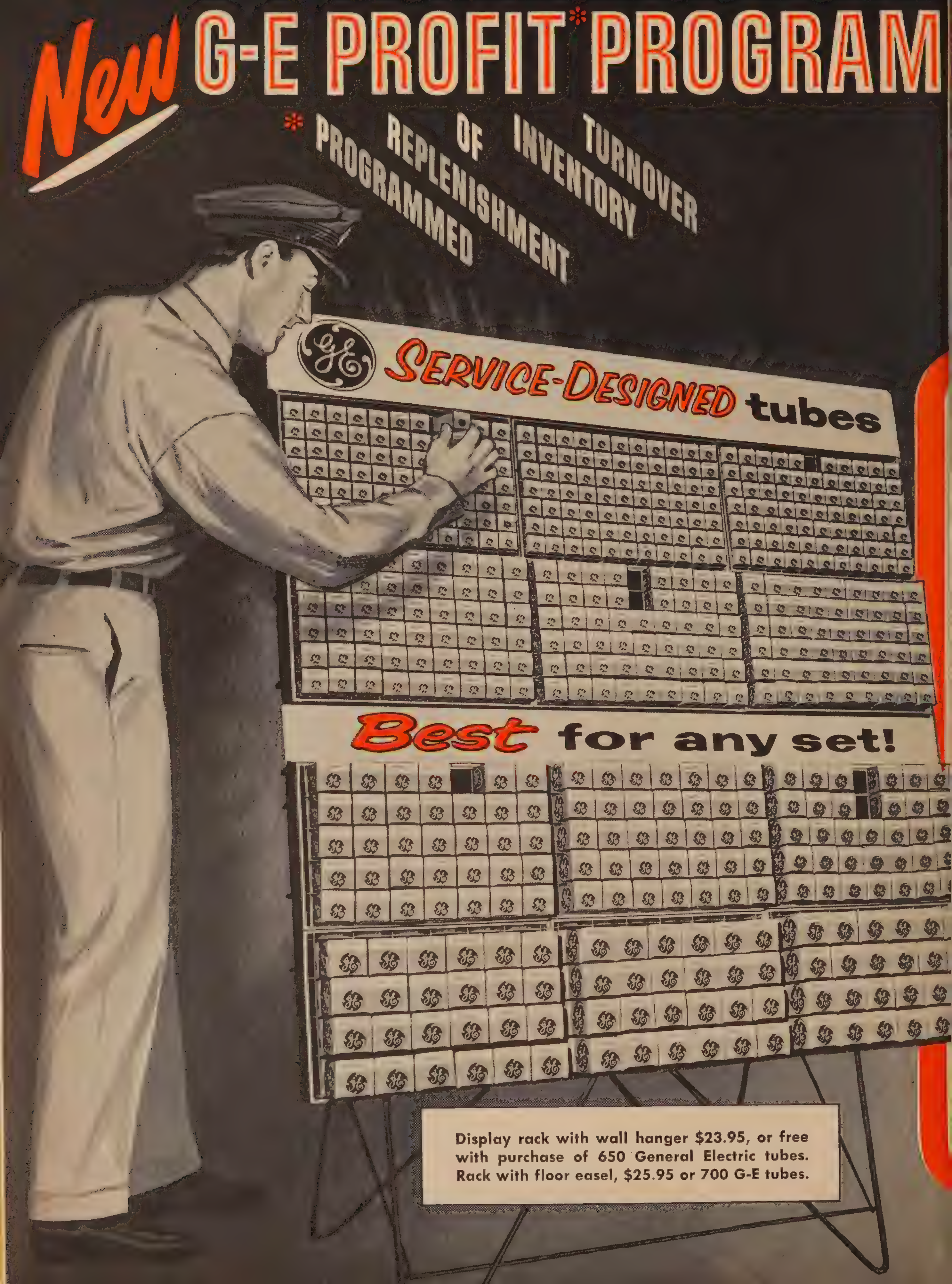
The IBM "650" computer services maintained at Sangamo materially aid our design engineers in solving complicated networks for envelope delay, phase shift and attenuation characteristics.

Write for Inductive Component Bulletin Series IC-260

SC-59-7

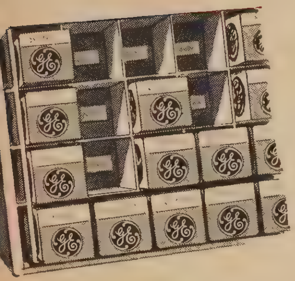
SANGAMO ELECTRIC COMPANY, Springfield, Illinois

--designing towards the promise of tomorrow

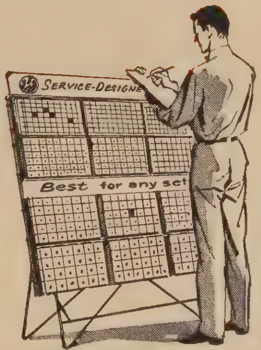

New G-E PROFIT* PROGRAM
* PROGRAMMED REPLENISHMENT OF INVENTORY TURNOVER
G-E
SERVICE-DESIGNED tubes
Best for any set!

Display rack with wall hanger $23.95, or free with purchase of 650 General Electric tubes. Rack with floor easel, $25.95 or 700 G-E tubes.

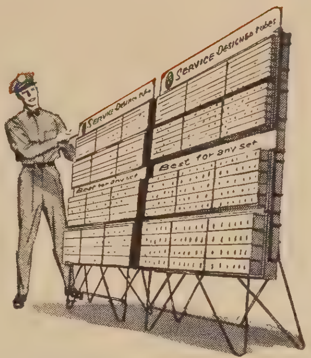
Streamlines Your Tube Sales for Fast Turnover, Top Volume!



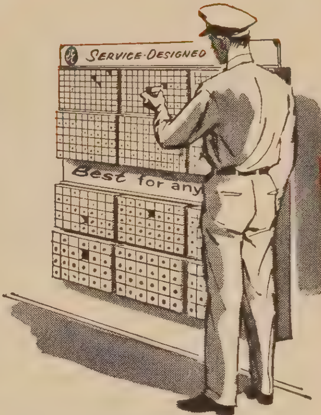
Missing cartons show what tube types you should reorder.



Your tube inventory can easily be checked at a glance.



A second display will accommodate additional supply of tubes.



Rack can be hung on a wall if floor space is not available.

A General Electric "first"...that sells more tubes, saves record-keeping, *provides the tubes you need when you need them!* This is G.E.'s new PROFIT* Program, packaged for you in the finest, most complete tube display rack ever offered to TV technicians.

See (left) how easy it is to select types... how stock rotation is assured by orderly tube removal and replacement! Note the Display's ample dimensions—44″ high plus 16″ for easel base; 40½″ wide—providing plenty of space for a scientifically planned tube inventory!

If you invite customer self-service, the Display is ideal for that purpose. Also, your stock of tubes can be checked visually at any time. Missing cartons tell you what types to reorder, and how many, since the type numbers of all tubes taken out can be recorded in back. Book-keeping is virtually eliminated.

Over-stocking and tube shortages: both are banned by the Balanced Inventory feature. Your tube dollars work harder than ever before. See your nearby G-E tube distributor today about General Electric's Service-Designed Tube Display with brand-new, built-in inventory control! *Distributor Sales, Electronic Components Division, General Electric Company, Owensboro, Kentucky.*

Progress Is Our Most Important Product

GENERAL ELECTRIC

2-111-222

STANDARD OF COMPARISON
R
RADIART
VIBRATOR
TYPE
5301
BASE CIRCUIT
A
INPUT VOLTAGE
6

The Greater Vibrator

Radiart Vibrators are unaffected by bounce, jounce, heat, cold, moisture. There's a replacement type for every 6- and 12-volt application. Ask your Radiart Distributor for a free Radiart Vibrator Replacement Guide or write The Radiart Corporation, 2900 Columbia Avenue, Indianapolis 5, Indiana.

RADIART TOBE Vibrators

News of the Industry

YASHICA CO., LTD. is mass-producing in Japan the new Yashica YT-100 six transistor portable radio.

VIS-U-ALL has appointed STRAL ADVERTISING CO., Chicago, its agency and marketing counsel to assist in planning a new promotion program.

HERMAN H. SMITH, INC., has acquired RADIO ESSENTIALS, INC. and AMERICAN RADIO HARDWARE, INC.

WELLER ELECTRIC CORP. has named JOHN ROGERS to a new field sales post to service accounts in O., W. Va., Md. and Del.

ALLIED RADIO has been joined by SAMUEL S. CRANDELL as Customer Services Mgr., and MARVIN RUBIN as Staff Asst. to ALEX BRODSKY, Vice Pres. & Gen. Mktg. Mgr.

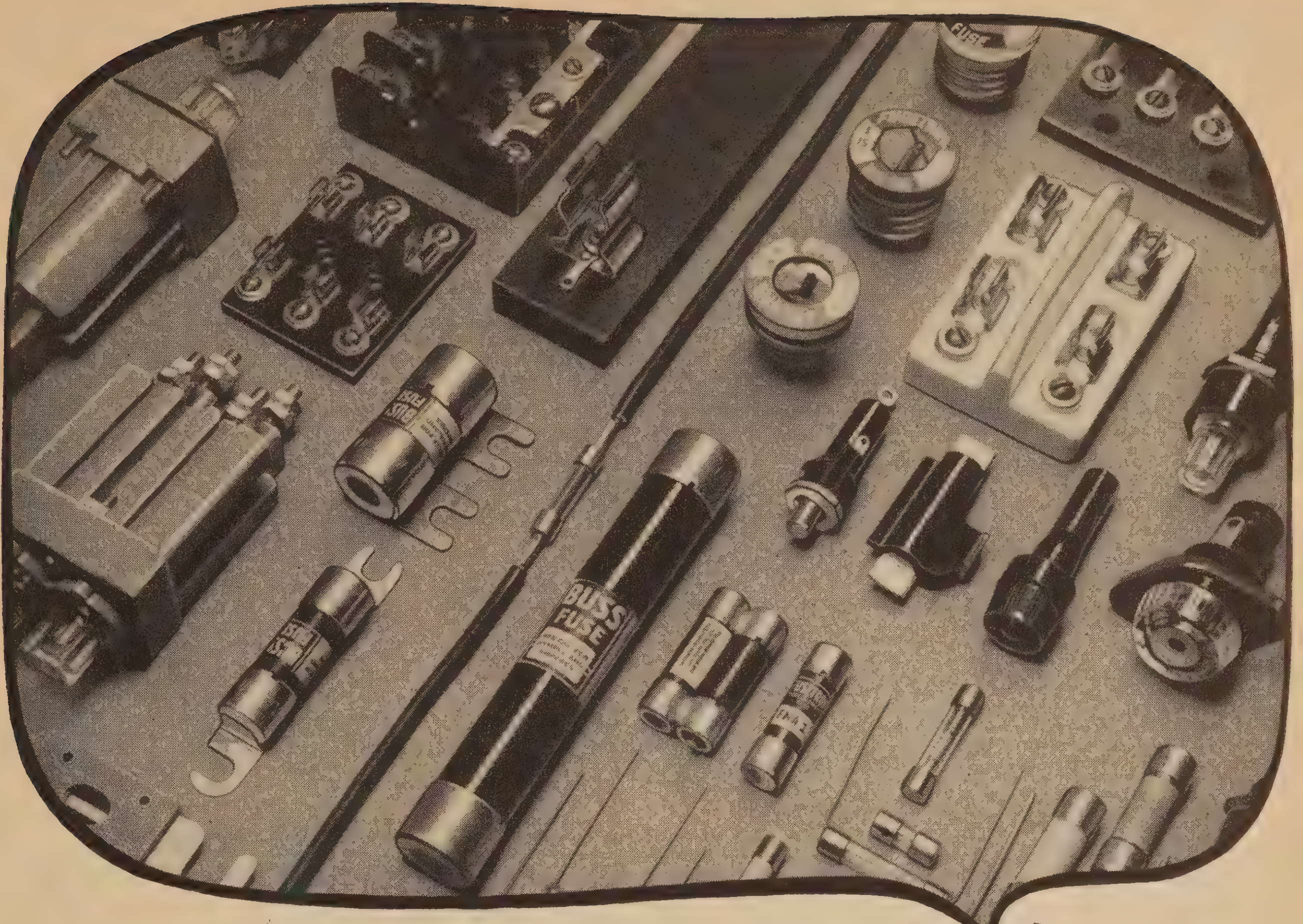
CURTIS MATHES & SONS is standardizing 23-inch television screens in their production and predicting the 23-inch screen will become the vehicle for tapping the 40 million unit television replacement market.

RAYTHEON Semiconductor Div. has named ROBERT A. IRVIN Mgr. headquarters sales operations. GEORGE A. STRICHMAN has been named Dir. of Mfg. Services for the company. The LIBERTY MUTUAL INSURANCE CO. awarded the Industrial Tube Div. a plaque commemorating four million accident-free man hours.

ADMIRAL CORPORATION has appointed LARRY L. MALIN to the newly created post of Field Merchandising Supervisor. The following four new field merchandising specialists were named: MERLE M. FARBER, EUGENE N. BEZROUKOFF, HARVEY GERALD and MILTON T. FUGLESANG.

WESTINGHOUSE Electronic Tube Div. reported the following: WALLACE F. BAKER has been named Mgr. of renewal sales with headquarters in Elmira; JOHN J. DOYLE was appointed mid-West Sales Mgr., headquarters in Chicago; HAROLD G. CHENEY will retire October 1st after 39 years with the company; and RAYMOND W. ANDREWS was named Mgr. of renewal market administration. An unusual outdoor billboard campaign, designed to spur sales of TV tubes has been launched by the div. The Television-Radio Div. announced that qualified service technicians across the country are being invited to view the company's 1960 television and stereophonic high fidelity lines at special advanced Distributor-to-Dealer showings beginning August 20th.

(Continued on page 23)



To Assure You Safe, Trouble-Free Electrical Protection

every BUSS Fuse is electronically tested!

Before a BUSS or FUSETRON fuse ever leaves the plant, it must meet our high quality control standards.

Each fuse is tested in a sensitive electronic device that automatically rejects any fuse not correctly calibrated, properly constructed and right in all physical dimensions.

Thus . . . by selling and installing BUSS and FUSETRON fuses you have one more way to help safeguard your reputation for service and reliability.

Complete Line For All Your Fuse Needs

Single-element fuses for circuits where quick-blowing is needed.

Single-element fuses for normal circuit protection.

Dual-element, slow-blowing fuses for circuits where harmless current surges occur.

Indicating fuses where signals must be given when fuses open.

BUSS fuses range in size from 1/500 amperes up — and there's a companion BUSS line of fuse clips, blocks and holders.

Your customers Know and prefer BUSS fuses

The ready acceptance of BUSS fuses is built on the millions upon millions of BUSS fuses used in homes and industry over the past 44 years. When you furnish BUSS, your customers instantly recognize that you are providing them with the finest electrical protection possible.

For more information, write for BUSS bulletin SFB.

BUSSMANN MFG. DIVISION,
McGraw-Edison Co.
University at Jefferson, St. Louis 7, Mo.

959

BUSS fuses are made to protect - not to blow, needlessly.

BUSS makes a complete line of fuses for home, farm, commercial, electronic, electrical, automotive and industrial use.

FUSETRON
TRUSTWORTHY NAMES IN ELECTRICAL PROTECTION
BUSS

McGRAW EDISON

SELL THE ANTENNA LINE THAT HELPS YOU SELL!

Cash in on...

Winegard's

...the Industry's Greatest

TV FM
Winegard
ANTENNA SPECIALIST
Winegard
PROMOTION BUCK
FOR TV ANTENNA DEALERS

SEE the big-name TV stars such as ★ Ward Bond of "Wagon Train" ★ Walter Brennan of "The Real McCoy's" and other TV stars promoting Winegard Color'Ceptors!

SEE Winegard's advertising in a non-stop, big-space schedule in LIFE, Better Homes & Gardens, others, *ALL YEAR LONG!*

GET FREE PROFIT-MAKING SALES AIDS

GET Winegard's new "PROMOTION BUCKS"! Given to you free with every Color'Ceptor you buy. You use them for getting *your own choice* of the finest sales promotion aids anyone has ever offered — knock-out sales helps that hitch your business to the giant national sweep of *Winegard's BIG TV SHOW TIME!*

Sell the Winegard Color'Ceptor, the only antenna that's GUARANTEED to give your customers the BEST reception — In the rare event, a customer of yours is not satisfied — Winegard will refund the list price of the antenna and YOU KEEP YOUR FULL PROFIT.

Talk to your Distributor or send coupon for the whole story.

FEATURE THE LEADER AND BE ONE!

Winegard
Gold Bond Guarantee
FOR YOUR PROTECTION
Nº 14126

SEND THIS COUPON TODAY!

WINEGARD CO.
3019-9 Scotten , Burlington, Iowa

☐ RUSH full color brochure showing Winegard's new antenna dealer sales aids . . . and tell me how I can get them free!
☐ Send literature on Winegard's complete line of FM and TV antennas.

FIRM NAME____________________
ADDRESS____________________
____

Winegard Co.

3019-9 Scotten, Burlington, Iowa

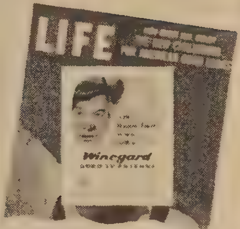
As Advertised in

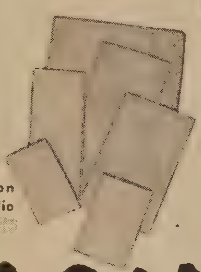
OUT WHERE THE SALES BEGIN

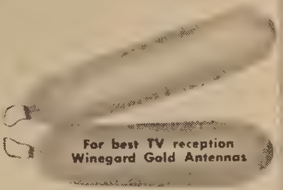
Color'Ceptor full-color mailing piece and full-color postcards for your direct mail program.

factory authorized
ANTENNA SPECIALISTS
SALES - INSTALLATION
Winegard
TELEVISION ANTENNAS
Special window decals.

BEST RECEPTION
Winegard
GOLD TV & FM
ANTENNAS
DEALER'S NAME & ADDRESS GO HERE
Giant 6 foot 3-color metal road sign imprinted with your name.


LIFE
Winegard
Year-round big-space national advertising featuring big name TV stars.

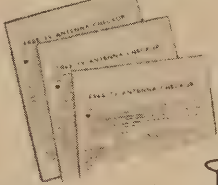

Unlimited 50-50 co-op on local newspaper and radio advertising.

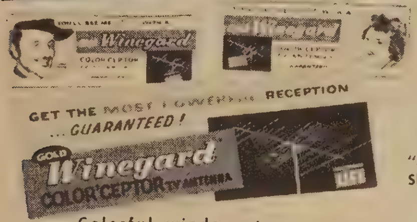

For best TV reception
Winegard Gold Antennas
Big gold balloons for the kiddies.

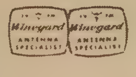
BIG TV SHOW TIME!

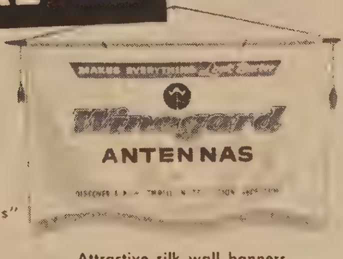
All-Out Antenna Profit Drive!

INSIDE YOUR STORE


Antenna check-up sheets.

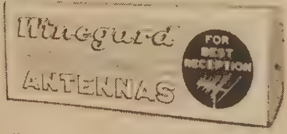

Winegard
GET THE MOST POWERFUL RECEPTION
... GUARANTEED!
GOLD
Winegard
COLOR'CEPTOR TV ANTENNA
Colorful window streamers.


Winegard
ANTENNA SPECIALIST
Winegard
ANTENNA SPECIALIST
"Antenna Specialists" Shirt Emblems.


Winegard
ANTENNAS
Attractive silk wall banners.

Let us install a
Winegard
GOLD ANTENNA
for you today . . . see better TV tonight!
ASK US ABOUT
Winegard
WRITTEN FACTORY GUARANTEE OF 100% SATISFACTION
As Advertised in LIFE
New Color'Ceptor display with gold anodized mast.

Gold anodized sample to hand out on service calls.


Winegard
FOR BEST RECEPTION
ANTENNAS
Illuminated plastic window sign.

OUTSIDE YOUR STORE

WE RECOMMEND
Winegard
GOLD TV and FM
ANTENNAS
FOR BEST RECEPTION
Eye-catching metal flange sign.

FOR BEST RECEPTION
TV FM
Winegard
GOLD
ANTENNAS
Special truck decals.

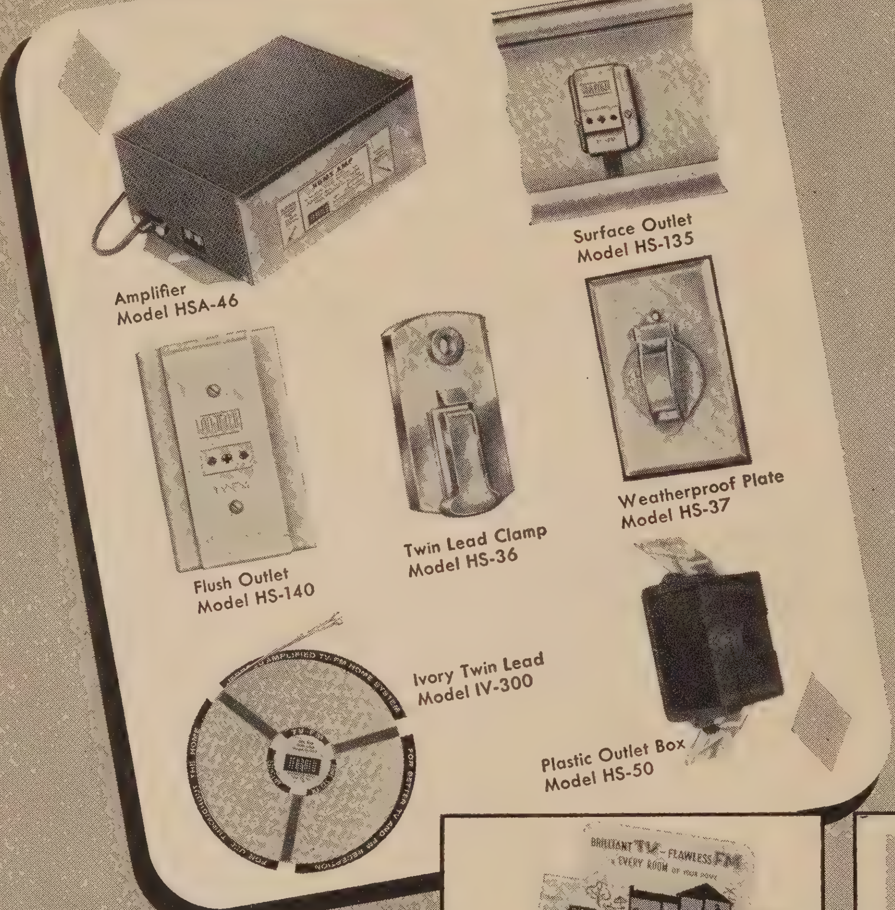
WE RECOMMEND
Winegard
GOLD TV and FM
ANTENNAS
FOR BEST RECEPTION
DEALER NAME
Hanging store front sign imprinted with your name.

ALL THESE SALES AIDS FREE—Ask Your Distributor

Dealer's Choice . . .

JERROLD'S TV/FM HOME SYSTEM

now available in
any combination


Amplifier
Model HSA-46
HOME AMP
Surface Outlet
Model HS-135
Flush Outlet
Model HS-140
Twin Lead Clamp
Model HS-36
Weatherproof Plate
Model HS-37
Ivory Twin Lead
Model IV-300
Plastic Outlet Box
Model HS-50
JERROLD AMPLIFIED TV-FM HOME SYSTEM
FOR BETTER TV AND FM RECEPTION
TV-FM

TV/FM Home Amplifier
Greatly improves TV and FM reception. Only 2 tubes:
$49.95 list

Plug InTenna Outlets
For use with one or more TV and/or FM sets. Combines "tap off" with "plug-in receptacle" in a single unit. No interference between sets. No soldering or wire stripping.
Model HS-140: **$2.75** list
Model HS-135: **$1.95** list

Plastic Outlet Boxes
For mounting flush outlets:
$.45 list

Weatherproof Cover Plate
$1.70 list

Ivory Twin-Lead
100-foot reel, 300 ohm:
$3.50 list

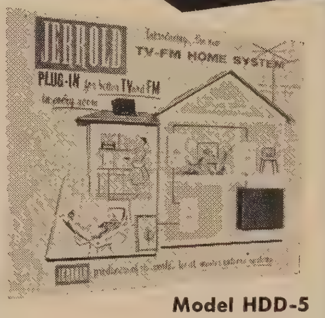
Twin Lead Insulators
Molded polyethylene.
Bag of 24: **$1.80** list

or complete kit

BRILLIANT TV – FLAWLESS FM
in EVERY ROOM OF YOUR HOME
JERROLD
MASTER TV-FM HOME SYSTEM
PLUG-IN TV
PLUG-IN FM

Model HSK-300
Includes amplifier, twin lead, five outlets for either flush or baseboard mounting and accessories: **$67.75** list

working display


JERROLD
TV-FM HOME SYSTEM
PLUG-IN for better TV and FM

Model HDD-5
Sparks customer interest. Pre-wired 5-outlet master antenna system: **$51.98**

JERROLD ELECTRONICS CORPORATION *Distributor Sales Division*

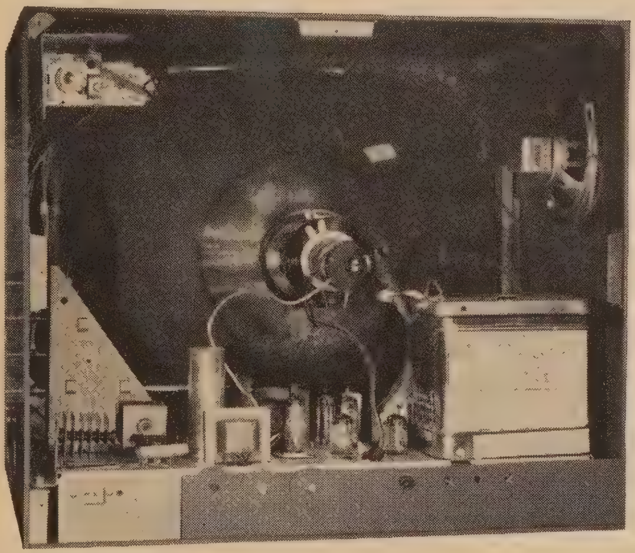
Dept. PD 185 • The Jerrold Building • Philadelphia 32, Pa.

Jerrold Electronics (Canada), Ltd., Toronto, Ontario • Export Representative, CBS International, N.Y. 22, N.Y.

LOOK TO JERROLD FOR AIDS TO BETTER TELEVIEWING

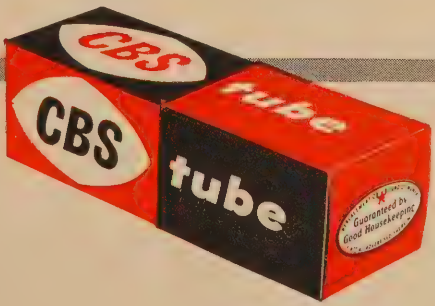
CBS TELEVISION SHOWS TOP-RATED BY RATING SERVICES

This year, 20 out of the top 40 television shows were CBS. And 18% more people watched CBS Television Network programs than those of its nearest competitor. Typical is the ED SULLIVAN SHOW, top-rated program for over eleven years.



CBS TUBES TOP-RATED BY LEADING SET MANUFACTURERS

Leading set manufacturers constantly rate and re-rate receiving tubes for quality . . . brand by brand, type by type. We are proud to report that month after month CBS tubes consistently earn top ratings from these manufacturers, and maintain this approval.

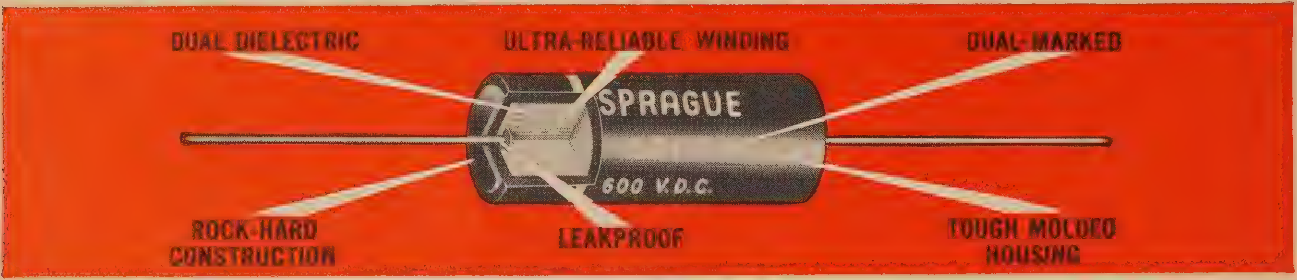


TO YOU, this is unquestionable proof that when you choose CBS tubes, you choose top-rated quality . . . quality you can depend upon to cut your call-backs to the bone. Always ask for CBS . . . the top-rated name all your customers know and trust.

Receiving, industrial and picture tubes • transistors and diodes • audio components • and phonographs

CBS ELECTRONICS
Danvers, Massachusetts
Manufacturing division of Columbia Broadcasting System, Inc.

DIFILM®



BLACK BEAUTY®
CAPACITORS
BEAT HEAT AND HUMIDITY

New DIFILM Black Beauty Capacitors lead the way in tubulars! The operating temperature range of these new capacitors goes up to 105 C (221 F) *without voltage derating.* Capacitance tolerance is held to ± 10%.*

- The new dual dielectric used in DIFILM Capacitors combines the proven long life of paper capacitors with the effective moisture resistance of polyester plastic film capacitors . . . to give you performance that can't be beat.

- Here's the kind of performance you can expect from DIFILM: very high insulation resistance, low power factor, moderate capacitance change with temperature, excellent retrace under temperature cycling, and superior long-term stability . . . *all at regular prices!*

- This high performance is fully protected by HCX®, an exclusive Sprague hydrocarbon material which impregnates the windings, filling all voids and pinholes before it polymerizes. The result is a solid rock-hard capacitor section. These capacitors are further protected by an outer molding of humidity-resistant, non-flammable phenolic.

For complete technical information on DIFILM Black Beauty Capacitors, write for Bulletin M-759 to Sprague Products Company, 65 Marshall St., North Adams, Mass.

*From .001 µF up

The major capacitor improvements come from

SPRAGUE®
world's largest capacitor manufacturer

SPRAGUE RESEARCH IS CONSTANTLY PRODUCING NEW AND BETTER CAPACITORS FOR YOU

(Continued from page 16)

EICO Pres. Harry Ashley was one of 11 top business executives to receive the "American Success Story Award" given by the Free Enterprise Awards Assoc. for "up-from-the-ranks" success.

CLEVITE has promoted LINWOOD C. HUFF to Mgr. of Commercial Engineering, and appointed WALTER HARRISON Sales Engr. for the new Los Angeles-Western regional offices.

AMPEX CORP. has received an order from the National Education Television and Radio Center for approximately $2,500,000 of Videotape Television Recorders for 43 U.S. educational TV stations.

RCA Electron Tube Div. announced ROBERT S. BURNAP, pioneer electron tube engr., retired as Mgr., Commercial Engineering. He will continue to serve the div. as a consultant and EDWARD C. HUGHES, JR. has been appointed to the position previously held by him.

JFD ELECTRONICS CORP. announces their newly created Board of Directors: Pres. and Treas., ALBERT FINKEL; Exec. Vice Pres. and Secy., EDWARD FINKEL; Vice Pres., contract and military div., ISADORE FINKEL; Vice Pres., electronic components div., JACK GOODMAN; Vice Pres., production, HARVEY FINKEL.

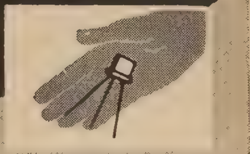
WINEGARD CO. has received U. S. Patent No. 2,891,748 for its Universal Tripod Antenna Roof Mount, originally designed and introduced by Winegard in 1956. The company has filed suit for patent infringement against the TV Discount Center, Hickory, N.C., charging that antennas sold by the dealer infringe Winegard Patent No. 2,700,105.

COLMAN ELECTRONIC PRODUCTS reports two new appointments: RICHARD P. PAVEK, New-Product Development Mgr., and J. MALCOLM FLORA, INC., sales rep for the territory of Michigan. Additional warehouse and production line space is being added to increase floor space by approximately 50%.

AMPEREX announces two promotions to new executive positions: JOHN MESSERSCHMITT, Mgr., Power Tubes and Renewal Sales and IRWIN RUDICH, Mgr., Special Purpose Tubes and Semiconductors. The company is adding a new 13,000 sq. ft. engineering wing to their present Hicksville, L.I. location, to be completed in October 1959.

ERIE RESISTOR CORP. has promoted JOSEPH T. ZURAVLEFF to Regional Sales Mgr., of the newly-organized Midwestern Regional Sales Dist. of the Electronics Div. Assisting him will be W. J. WERVEY, P. E. SNYDER and W. B. TUSCANY. CORNING GLASS WORKS' newest resistor, the ¼ watt N65, is now available from all Erie-Corning distributors.

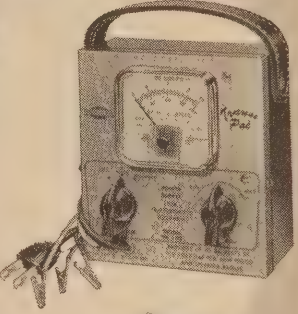
Transistor Radio Servicing CAN be Highly Profitable



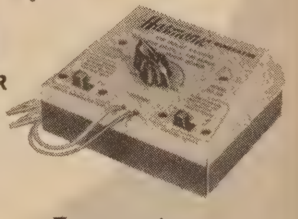
The ONLY Complete Transistor Radio Service Lab
Everything you need for less than $50

Check Transistors, Diodes, Rectifiers . . .
SENCORE TRC4 TRANSISTOR CHECKER
Accurately checks all transistors in hearing aids, radios and power transistors in auto radios. Tests for opens, shorts, leakage, current gain. Measures forward-reverse current ratio on all crystal diodes. Measures forward and reverse currents on selenium rectifiers. With set-up chart for accurate checking of each transistor. Size, 5x4½x2½″. With batteries. DEALER NET............... 17^{95}

Replace Batteries During Repair . . .
SENCORE PS103 BATTERY ELIMINATOR
All-new "Transi-Pak," twin to TRC4 Checker above. Provides variable DC voltage to 24 volts; 1.5-volt biasing tap (a "must" for servicing Philco and Sylvania radios). Metered current output, to 100 ma. Handles 200-ma peaks. Two 200-mfd electrolytics provide proper filtering and low output impedance. No hum or feedback problems. Ideal for alignment using station signal; adjust IF slugs for max. current, also ideal for charging nickel-cadmium batteries. Size, 5x4½x2½″. DEALER NET......................... 17^{95}



Find Defective Stage in a Minute . . .
SENCORE HG104 HARMONIC GENERATOR
New signal generator designed primarily for fast signal-tracing of transistor radio circuits. No need to unsolder all transistors. Provides RF, IF and audio signals *simultaneously*, drastically cutting service time. Traces from speaker to antenna. Clear 1000 cycle note signal is heard in speaker from all good stages. Signal weakens or stops at defective stage. Equally as effective for testing TV, hi-fi and other audio circuits also. Size, 3½x4½x1¾″. With batteries. DEALER NET.......... 9^{95}



Turn page for other SENCORE® Time Savers

See your Parts Distributor NOW!

SENCORE
ADDISON 2, ILLINOIS

TEXAS INSTRUMENTS elected E. O. VETTER Vice Pres. He will assume on September 1st the position of Div. Mgr. of Metals & Controls Div. in Attleboro, Mass.

IRC reports the following appointments: DARRELL V. JARVIS, Asst. District Sales Mgr. for the Chicago Territory; WALTER J. BEAGAN, Sales Engr. in charge of engineering products sales for the N.Y. territory; and CHARLES G. SMITH, Los Angeles Dist. Sales Mgr. Products made by the Circuit Instruments Div. will henceforth be marketed by IRC's own sales organization in the S. Calif. territory directly out of the West Coast office.

PRECISION TRANSFORMER CORP. will erect a new $500,000 plant having a total of 50,000 sq. ft. in Elk Grove, Ill. Completion date is projected for spring of 1960.

PHILCO Consumer Products Div. has named RAYFORD E. NUGENT Vice Pres.-Sales. The PHILCO SERVICE BUSINESSMAN Magazine conducted a contest to find the "Earliest Bird"—the oldest, in point of service, member of Philco's service programs. The contest was won by HARRY GOODCHILD who has been a continuous member of Philco Factory-Supervised Service, the descendant of Radio Manufacturers Service, since 1933.

Electronic tube
6BZ6
6CB6A

HAVE A CLEAR PICTURE EVERY TIME!

Install General Electric Service-Designed 6BZ6's and 6CB6-A's for optimum AGC performance in all signal areas!

Strong signal or weak, these General Electric video IF-amplifier tubes do the same fine job. Grid characteristics are closely controlled over the full operating curve, in order that the 6BZ6 and 6CB6-A may show proper response to widely varying AGC voltages. Give your customers real-life TV whether reception is strong, intermediate, or fringe-area!

Goodwill grows, callbacks are less when you replace with Service-Designed 6BZ6's and 6CB6-A's—built and tested to perform efficiently under *all* conditions! These improved pentodes pay off in better TV that brings new business to your door. See your G-E tube distributor! *Distributor Sales, Electronic Components Division, General Electric Company, Owensboro, Kentucky.*

Progress Is Our Most Important Product

GENERAL ELECTRIC

2-111-207

Audio NEWS LETTER

WALCO stylus pressure balance and turntable level kit lists @ $2.50.

CBS ELECTRONICS exchanges license rights and takes over U. S. distribution of RONETTE products, effective Aug. 3, 1959.

AMERICAN MICROPHONE announces the D-10 omnidirectional microphone @ $29.50 Response is 50 to 11,000 cps, output level −57 db.

ELECTRONIC REPRESENTATIVES are again sponsoring the Detroit Hi-Fi Show, Oct. 16-18. Show manager will be Henry Goldsmith of Rigo.

MELODY MASTER announces the Permadyne extended range moving coil dynamic earphone line. Jobber sales outlets are being established.

HARMAN-KARDON introduces three units. Chorale Model A260 stereo preamp-amplifier @ $199.95 (optional enclosure @ $12.95) is rated at 30 watts/channel, features 3rd channel speaker selector, tone control defeat switch and silicon diode power supply. Ballad Model A230 dual 15-watter is Sonnet Model T230, AM/FM tuner with afc is $119.95 with enclosure.

BOGEN-PRESTO reports its Challenger Model RC412 AM/FM stereo receiver @ $169.50 is now in production. Ratings are 6 watts/channel 30 to 15,000 cps ±1 db. Also, in production, the ST442 stereo FM/AM tuner @ $149.50. Sensitivity is 1.5 μv at 30 db quieting at 75 ohm input for FM. Includes afc. Two new intercom systems have been announced: CHM6 master is $45.95; CHM12 is $49.95. CHR remote is $12.95. This company has extended rep Morris Taylor's territory to include W.Va. and W. Pa. in addition to the southeast.

RCA distributors are now selling Type 264C1 magnetic tape cartridges with blank tape for home recording. Units provide one hour of stereo play.

DEXTER CHEMICAL introduces the Dextrafix mechanical tone arm control @ $4.95. Elevator arrangement lowers arm into lead-in groove gently and accurately, and lifts it at any point. Device is easily attached to record player base.

TELECTRO introduces the 15-lb. Model 1965 monophonic tape recorder with stereo playback @ $79.95. Also, 3-speed Model 400 @ $289.95.

MADISON FIELDING assets have been acquired by CROSBY ELECTRONICS, subsidiary of merged Crosby-Teletronics Corp. Pres. Murray Crosby says line will continue to be produced. BRAND PRODUCTS will market it nationally.

(Continued on page 27)

Servicemen! SAVE TIME...SUBSTITUTE THE SENCORE WAY

The Fastest, Surest Method Known!

Substitute for Capacitors, Resistors

SENCORE H-36—THE "HANDY 36"

36 most-often-needed resistors and capacitors, for fast, easy, direct substitution in all circuits. • Eliminates searching for replacement components for test purposes. • Avoids unnecessary unsoldering and soldering—no more solder mess. • Pays for itself the first month in time saved. • Flick of a switch instantly selects any one of . . .
24 RESISTORS from 10 ohms to 5.6 megohms
10 CAPACITORS from 100 mmfd to .5 mfd
2 ELECTROLYTICS, 10 mfd and 40 mfd
DEALER NET.......................... 12^{75}

Substitute for Electrolytic Capacitors

SENCORE ES102 ELECTRO-SUB

Usable from 2 to 450 volts, D.C.

Contains 10 electrolytics from 4 to 350 mfd. Select the correct value with the flick of a switch. Features automatic discharge, surge protector circuit. Prevents accidental "healing" of capacitor being bridged. Completely safe—no arc or spark when connecting or disconnecting. DEALER NET........... 15^{95}

Substitute for Fuse Resistors During Repair

SENCORE FS3 "FUSE-SAFE" CIRCUIT TESTER

Instantly tells you whether or not it is safe to replace fuse resistors, fuses, or circuit breakers. Separate red and green scale for each commercially available fuse resistor used in radio and TV. Eliminates guesswork and wasted time. Also handy for wattage checks up to 1100 watts. DEALER NET............ 8^{95}

Substitute for Bias Batteries During Repair

SENCORE BE3 "ALIGN-O-PAK"

Completely isolated DC supply, with less than 0.1% ripple. Eliminates messy batteries in TV service work. Handy for alignment, AGC trouble-shooting, or checking gated sync circuits. Just dial the voltage you need, 0-18 volts, positive or negative. Covers all voltages recommended by TV set manufacturers. Size, 3½x4½x1¾". For 110-120 volts, 60 cycle AC. DEALER NET............................ 7^{85}

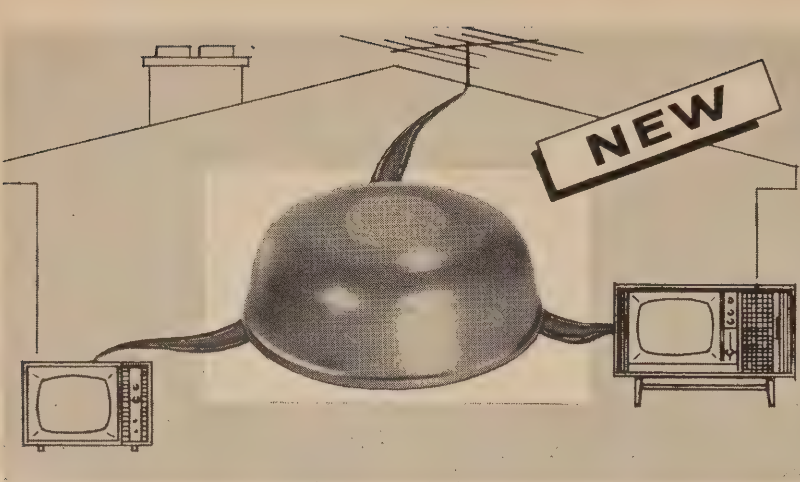
UNIVERSAL TV JUMPER CORD

Fits any set from back to chassis. Box has male and female plugs for additional power source, soldering, etc. DEALER NET 1^{95}

Turn page for other SENCORE® Time Savers

See your Parts Distributor Now!

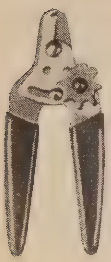
SENCORE
ADDISON 2, ILLINOIS



Walsco 2-Set TV-FM Couplers

A Walsco Exclusive . . . both these couplers can be mounted on wall or mast before attaching leads. Standard Model for strong signal areas; Low Loss Model for fringe areas.

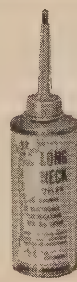
No. 1600 Standard.................... List $2.50
1602 Low Loss.................... 3.50



WALSCO STRIP-ER CLIP

New precision tool with accurate dial for stripping each wire size. Clips all wires from 12 to 26 gauge. Ground cutting edges, insulated grip.

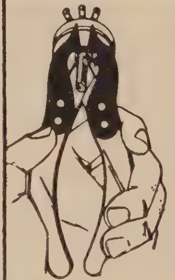
No. 595-X... List $2.30



WALSCO LONG NECK OILER

Reach all those hard-to-get oil cups, etc. All plastic container and nozzle; telescoping extension reaches 7 inches. Contains high quality all-purpose oil.

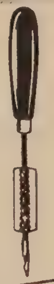
No. 985........ List $1.50



WALSCO C-RING TOOL

Specially designed to remove and insert "C" washers and retaining rings on tuners, control shafts, etc. High grade steel, nickel plated.

No. 585... List $3.15



WALSCO STICKLEBABY

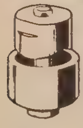
The only hand tool that drills and saws in any direction. Excellent for veneer work and fine carpentry. Combination drill, saw and rasp.

No. 586-00.... List $1.63

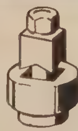
More For You...And The Price Is Right!

Walsco ELECTRONIC PRODUCTS

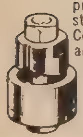
Everything You Need For Better Servicing

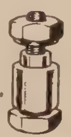

ROUND

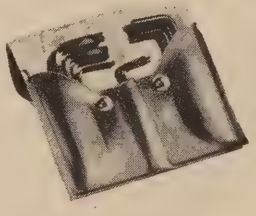
WALSCO CHASSIS PUNCHES


SQUARE

Make better chassis holes faster with Walsco's "Low-Torque" Punches. Specially hardened, precision ground tool steel; easy to use. Complete line of sizes and styles.


KEYED


"D"



WALSCO HEX & SPLINE KIT

Contains 11 of the most popular size hex and spline wrenches in durable plastic snap case. High grade alloy steel.

No. 560...................... List $2.25

WALSCO 100-PAK HARDWARE

All the quality electronic hardware items you need in convenient 100-to-a-box packages. Look for the Walsco Display at your jobber.

WALSCO PHONO DRIVES

The only complete line of replacement phono and recorder drives and belts on the market. Includes all the new model turntables and changers.

FREE! Write for your Walsco Catalog. Send postcard today.

Walsco ELECTRONICS MFG. CO.

Division of Textron Inc.
West Plant: Los Angeles 18, California Main Plant: ROCKFORD, ILLINOIS, U.S.A.
Canada: Atlas Radio Corp., Ltd., Toronto 19

YOU CAN GET WHAT YOU WANT FROM WALSCO!

(Continued from page 25)

IHFM CALIFORNIA show arrangements have been completed: San Francisco, Brooks Hall, Jan. 27-31; Los Angeles, Shrine Exposition Hall, Feb. 10-14.

REEVES SOUNDCRAFT expands and moves Chicago office to 28 E. Jackson Blvd. Also announced is the firm's listing on the American Stock Exchange.

HARTLEY PRODUCTS introduces the XP speaker @ $75. Features are polymerized cone, 1/2" excursion, 20 to 25,000 cps rating. Two-year warranty is given.

ROBINS INDUSTRIES announces the CS-1311 aluminum component slides for changers and turntables @ $3.50 per set. Load capacity is 30 lbs.

ORR INDUSTRIES is breaking ground for a new 10,000 sq. ft. plant. Firm also opens S. Calif. office and warehouse at 1715 E. Walnut St., Pasadena, under Sid Weiss.

CONTINENTAL MFG. introduces the MT-25 multiplex adapter for FM tuners @ $59.95. Ratings are -60 db noise; harmonics 1%; crosstalk -60 db; output 1.3 v. Also announced is the SA-30 dual stereo amplifier. 15 watts/channel. Has 10 db inverse feedback. $99.95.

JENSEN INDUSTRIES publishes the Jenselector needle guide, making replacement possible by visual selection. 52-page booklet is punched for 3-ring binder. Also announced is a spring-loaded plastic box with 9" x 2-1/2" x 2-1/2" tray modeled after grocery cheese containers. It holds up to 60 sapphires.

EMERSON'S on-again off-again purchase of 20% of WEBCOR stock, 650,737 shares, has been resolved. Webcor Pres. Titus Haffa has repurchased the stock at $22 per share, said to be $2/share over what Emerson paid on May 8. In addition, Haffa paid $100,000 for legal and other fees. Current price on Midwest Stock Exchange is under $14.

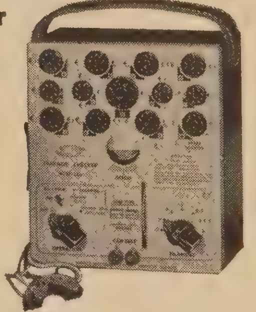
Check TUBES, VIBRATORS
THE SENCORE WAY
FAST ACCURATE TROUBLE SHOOTING

America's Most Popular Tube Tester
more than 25,000 now in use
SENCORE LC3 LEAKAGE CHECKER
Whips those "tough dog" tube troubles . . .

Ask any serviceman who owns one . . . or try one for just one day of servicing in your shop. You'll see for yourself how much time the LC3 can save *you*. Checks for leakage between all elements, whether caused by gas, grid emission or foreign particles. Also checks leakage on all capacitors with voltage applied—including electrolytics. Provides instant filament checks in "Fil-Check" position—no need for a second filament checker. One spare pre-heating socket and new roll chart prevent obsolescence. New charts provided—no charge. Leakage sensitivity; 100 megohms, control grid to all other elements; 50,000 ohms, heater to cathode. Size, 7x6x3½". Wt., 3 lbs. For 110-120 volts, 60 cycle AC. DEALER NET 28.95

NOW . . . checks 172 tube types—more than any other checker of this type.

NEW . . . replaceable Roll Chart prevents obsolescence.



Check Filaments of All Receiving Tubes and Picture Tubes

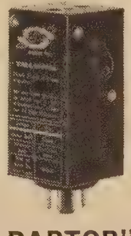
FC4 FILAMENT CHECKER

For fast, easy checking of all tube filaments, without pulling chassis. Neon light goes out if tube filament is good. Also acts as continuity and voltage tester. Neon lamp glows when 115 v. AC is applied by cheater cord, providing a check on power to TV set. Size, 3⅛x4x1". With leads. DEALER NET....... 2.95

Check 3- and 4-Prong Vibrators . . . Faster, Easier

VB2 "VIBRA-DAPTOR"

Plugs into any tube checker; ideal for use with LC3 above. To check 6-v. vibrators, set for 6AX4 or 6SN7; for 12-v. vibrators, set for 12AX4 or 12SN7. Two No. 51 lamps indicate whether vibrator needs replacing. Instructions on front panel. Steel case. Size, 1½x1½x3" DEALER NET................ 2.75



See your Parts Distributor NOW!

Turn page for other SENCORE Time Savers

SENCORE
ADDISON 2, ILLINOIS

RCA is producing a magnetic disc recording system for radio commercials. Disc is the same size as standard 45 record, contains up to 70 seconds of material per side and allows 10,000 replays.

SALES ENGINEERING ASSOCIATES, 46 N. 2nd Ave., Mt. Vernon, N.Y., introduces the FA-331-BB FM front end. This one-tube import features printed circuits, is rated at 2.5 μv sensitivity for 20 db quieting.

GLASER-STEERS has been purchased by AMERICAN MACHINE & METALS, reportedly for cash. Top management is expected to continue operations as a wholly owned subsidiary.

ALTEC LANSING offers two dealer programs providing intermixing of units and coop funds. Discounts are based on quantity purchases.

(Continued on page 29)

Really dresses up your service work

Reliable Tung-Sol tubes add real class to every service job — radio, tv, or hi-fi. Made to set manufacturers most exacting specifications, Tung-Sol Tubes are best for all replacements. Reduce your callbacks to new lows and keep your profitable new business rolling in high style. Tung-Sol Electric Inc., Newark 4, N. J.

Tell your jobber you'd rather have

ts TUNG-SOL®

Blue Chip Quality TUBES • TRANSISTORS • DIODES

(Continued from page 27)

LECTRONICS introduces British-made Quad electrostatic speakers.

OXFORD COMPONENTS names Bill Crawford assistant sales manager.

MINNEAPOLIS SPEAKER introduces Red Line of rear seat auto speaker kits.

DUOTONE extends 20/20 Deal on needle assortment through balance of summer.

SWITCHCRAFT introduces 306TR stereo-mono mixer with transistor amp @ $37.50.

FIDELITONE publishes 70-page needle guide and cartridge indentification key.

NORTHWEST HIGH FIDELITY SHOW sponsored by the Paul Bunyan Chapter of the Reps will be held in Minneapolis' Hotel Leamington, Dec. 4-6. Information is available from H. H. Cory, 1441 Northwestern Bank Bldg., Minneapolis 2.

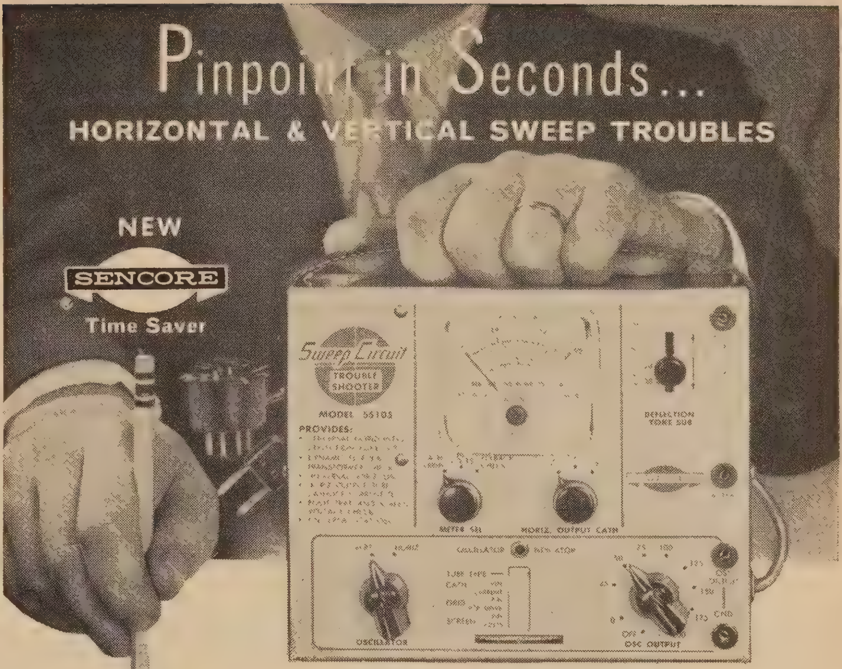
PACE (Producers of Associated Components for Electronics) is polling distributors on their attitudes and attendance at the three past Parts Shows in Chicago. In the first month, 567 replies were received out of 2200 survey forms sent. A compilation of returns will be issued in a special report.

E. J. KORVETTE, 4-state eastern discount house with $150 million volume, will open a hi-fi component department with demonstration facilities.

FLATTENED LOUDSPEAKER developed in Israel by the Weizman Institute of Science, does away with the conventional paper cone. A membrane with an imprinted zigzag winding replaces the coil. Frequency response is 20 to 25,000 cps. Headphone and microphone applications are predicted. Several lab models have been built.

Pinpoint in Seconds...
HORIZONTAL & VERTICAL SWEEP TROUBLES

NEW
SENCORE
Time Saver



The missing link in TV service . . .

SENCORE SS105 SWEEP CIRCUIT TROUBLE SHOOTER

HORIZ. OSC.
VERT. OSC.
HORIZ. O.P. STAGE
VERT. O.P. STAGE
HORIZ. FLYBACK XFORMER
VERT. O.P. XFORMER
HORIZ. DEFLEC. YOKE
VERT. DEFLEC. YOKE

IT'S A . . .

UNIVERSAL HORIZONTAL OSCILLATOR. For direct substitution. No wires to disconnect in most cases. Traces trouble right down to the defective component. Variable output from 0-200 volts, peak-to-peak.

HORIZONTAL OUTPUT CATHODE CURRENT CHECKER. A proven method that quickly checks the condition of the horizontal output tube and associated components. Adaptor socket prevents breaking wires. Easily replaceable Roll Chart gives all necessary pin, current and voltage data.

UNIVERSAL DEFLECTION YOKE. A new, simple way to determine yoke failure accurately—without removing yoke from picture tube. Merely disconnect one yoke lead and substitute. If high voltage (also bright vertical line) is restored, TV yoke is defective.

DYNAMIC FLYBACK TRANSFORMER CHECKER. Merely flip switch to "Flyback Check" and meter will indicate condition of flyback transformer, in degrees of horizontal deflection. Extremely sensitive and accurate; even shows up one shorted turn on flyback.

VOLTMETER. For testing bootstrap, screen and other voltages. Direct-reading voltmeter, 0-1000 volts.

UNIVERSAL VERTICAL OSCILLATOR. Checks oscillator, output transformer and yoke. Merely touch lead to component and check picture on screen.

Size, 7x6x3½". Wt. 4 lbs.
For 110-120 volts, 60 cycle AC.

DEALER NET 39^{50}

See Your Parts Distributor NOW!

SENCORE
ADDISON 2, ILLINOIS

NEW
HUSH
MIRACLE TV TUNER CLEANER

SERVICEMEN KNOW!

Here they pay less and get the best

HUSH®

Chemically-Electronically, engineered for Tuners and Switching Mechanisms.

When New HUSH is applied it will wash-away that dirt, leaving clean and positive contacts protected by a lasting lubricant. New HUSH is made from the finest solvents and it contains Electro-Silicone oils.

Also available—2 oz., 8 oz., 32 oz. containers — 6 oz. Spray can **$2.25** net

EVER - QUIET®

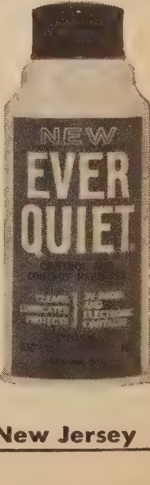
Since 1949

VOLUME CONTROL AND CONTACT RESTORER

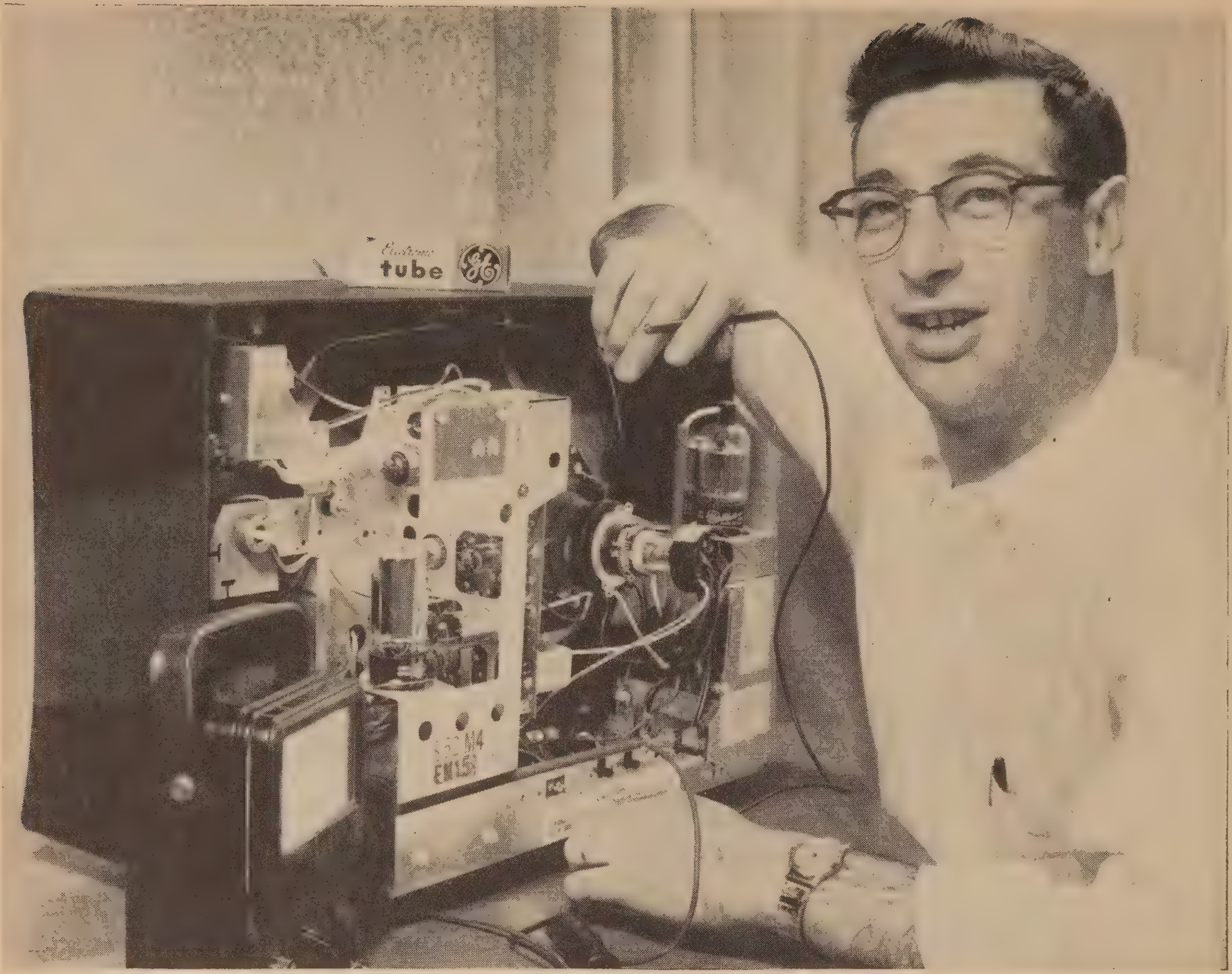
EVER-QUIET is a free-flowing liquid that leaves no powder residue. Scientifically designed to seep around the shaft and penetrate the control or potentiometer, cleaning the contacts and leaving a safe protecting film. Harmless to metals, wire or carbon.

Also available—32 oz. containers — 6 oz. Spray can **$1.59** net

2 oz. Bottle & dispenser **79c** net



CHEMICAL ELECTRONIC ENGINEERING, INC. Matawan, New Jersey



“IT’S A SNAP to get at the chassis in a ‘Designer’”

says Norm Murkoff, Service Manager of Rocket Stores, Inc., Poughkeepsie, N. Y.

“The minute you take the back off any General Electric ‘Designer’ TV receiver the chassis is right in front of you and it’s a snap to get at it,” says Norm Murkoff, Service Manager of Rocket Stores, Inc., in Poughkeepsie, New York.

“Rarely do you ever have to pull the chassis on this set to replace parts or circuit trace so we do 9 out of 10 repairs in the home.

“Because of the higher home completion rate we find we can make more calls and this, of course, means we make more money.

“Another thing we like about the ‘Designer’ is that we can get at both sides of the printed circuitry while the chassis is still in the cabinet.

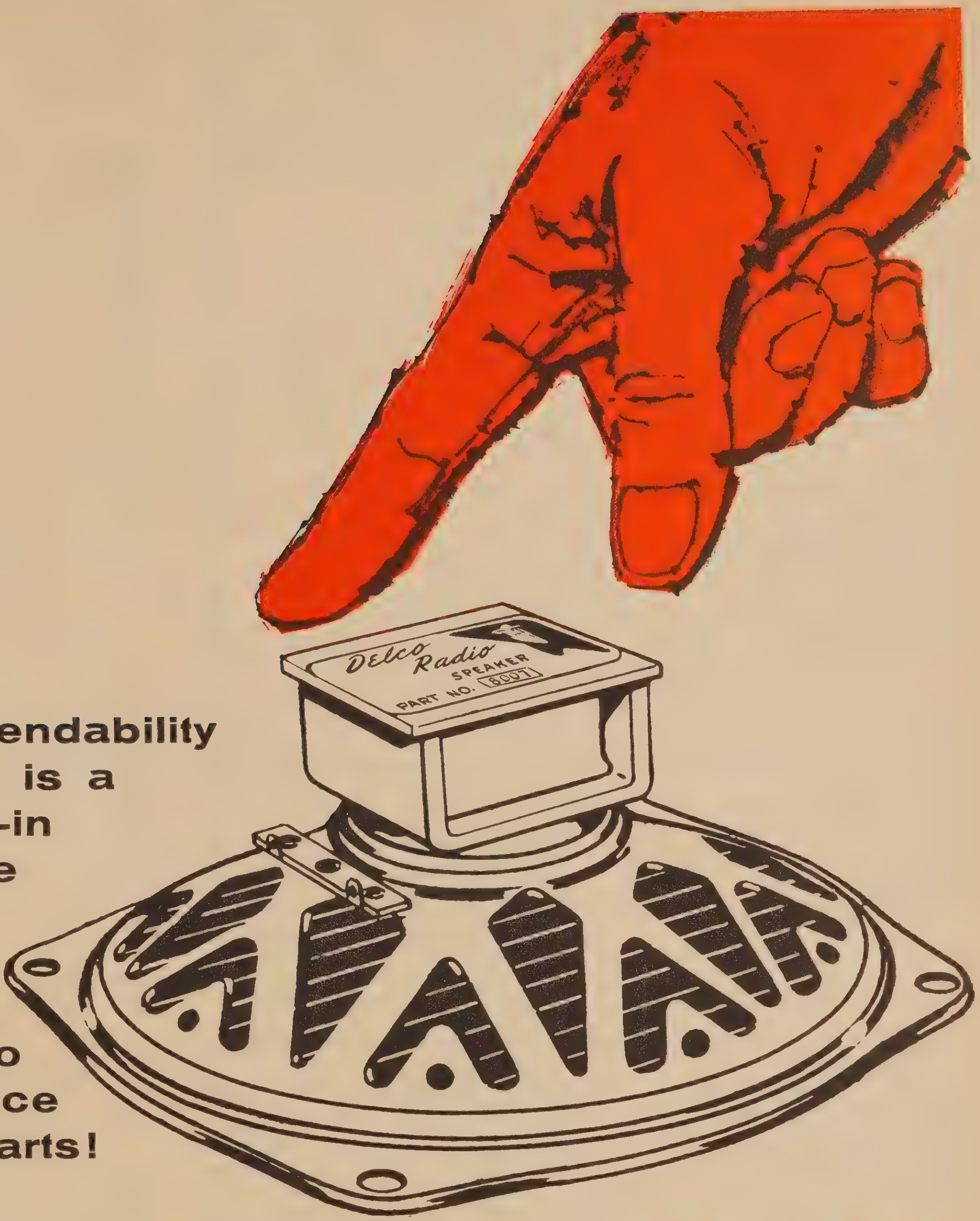
“Also, the tubes are directly replaceable, fuses are accessible, and you easily get at the key check points. Another thing: the painted schematic on the boards helps us find our way around very quickly.”

Precision Etched Circuitry is the name General Electric gives to its circuitry and it is used in all sets. This circuitry is reliable and uniform so that when you’ve serviced one you never have to puzzle over the next one.

“Designer” TV—called the easiest-to-service set in television! General Electric Company, Television Receiver Department, Syracuse 8, New York.

Progress Is Our Most Important Product

GENERAL ELECTRIC



Dependability is a built-in feature of all Delco Radio Service Parts!

Take speakers, for instance. Delco electronic speakers are built rugged for long life and resistance to extreme weather conditions. You can rely on them for exceptional power handling and rich distortion-free tone.

Delco's popular 8-inch "Hi-Fi" speaker, No. 8007, provides the most power and tonal range for the money. Designed for replacement use and high fidelity audio systems, it's a good, fast seller with price and quality appeal.

For speakers, transistors, transformers and other fine parts for Delco and other radios, see your Delco Electronic Parts Distributor. He carries the complete line. Other extras you get with Delco are • Wide selection of special application parts • Complete technical training program • Effective warranties • Dealer identification signs.

Stock with Delco Electronic Parts—more dependability and reliability for your customers, more profit for you.

DELCO
DEPENDABILITY
RADIO
RELIABILITY

Division of General Motors • Kokomo, Indiana

Available everywhere through
Electronic Distributors
associated with

GM U-M-S PARTS SALES
UNITED MOTORS SYSTEM

RCA TEST EQUIPMENT
"the professional's touch"

WR-69A TELEVISION/FM SWEEP GENERATOR
USE: for visual alignment and trouble shooting of TV rf/if/vf circuits and other electronic equipment. IF/Video frequency ranges 50 Kc to 50 Mc, TV channels 2 to 13, plus FM range—88-108 Mc. Sweep width 0-12 Mc or more. Output level—0.1 volt or more. Attenuation ratio 60 db or more below maximum output. $295.00* (including all cables, instruction book).

WO-91A 5-INCH COLOR-TV OSCILLOSCOPE
USE: high-performance, wideband oscilloscope ideally suited for color-TV black-and-white TV, and other electronic applications. Dual bandwidth (4.5 Mc, 0.053 volts rms/in.) (1.5 Mc, 0.018 volts rms/in.). Internal calibrating voltage and calibrated graph screen. Includes special direct/low cap shielded probe and cable. $239.50* (includes ground cable, insulator clip, instruction book).

WR-99A CRYSTAL-CALIBRATED MARKER GENERATOR
USE: to supply a fundamental frequency rf carrier of crystal accuracy for aligning and trouble-shooting color, black-and-white TV, FM receivers and other electronic equipment operating in 19 Mc to 260 Mc range. $242.50* (complete with output cable, two phone tips, instruction book).

WV-98A SENIOR *VOLTOHMYST®*
USE: for making accurate ac and dc voltage measurements as well as measuring resistances from 0 to 1,000 megohms. Measures peak-to-peak values of complex waveforms. Ruggedized, die-cast aluminum case. Large, easy-to-read 6½-inch meter! A fine VTVM for electronic technicians and engineers! Includes special dc/ac-ohms shielded probe and cable. $79.50* (complete with ground lead, alligator clip, instruction booklet).

WR-70A RF/IF/VF MARKER ADDER
USE: To be used with WR-69A, WR-99A or similar electronic equipment. Eliminates possibility of waveform distortion during visual alignment techniques by adding markers after the rf signal is demodulated. $74.50* (complete with cables, instruction book).

WT-110A *AUTOMATIC* ELECTRON-TUBE TESTER
USE: especially for TV and general electron-tube service testing through automatic punched-card selection of correct test conditions on wide variety of tubes. Checks vacuum-tube rectifiers under high-current conditions. $199.50* (complete with 263 punched cards, 24 blank cards, card punch, instruction book).

WR-46A VIDEO DOT/CROSSHATCH GENERATOR
USE: a "must" for making color-TV static and dynamic convergence adjustments in the home or shop. Derives sync from station-tuned TV set and reinserts highly stable video dot, bar, or crosshatch patterns to picture tube grids or video amplifier grids. $179.50* (complete with cables, instruction book).

WR-49B RF SIGNAL GENERATOR
USE: for alignment and signal tracing of AM/FM receivers, low-frequency signal tracing and alignment of TV vf/if amplifiers. Six ranges—85 Kc to 30 Mc. Internal 400 cps modulation. Low rf signal leakage! DC blocking capacitors at rf and af output terminals prevent damage to instrument or external circuits. $79.50* (complete with shielded cable for rf and af output, instruction book).

WR-61B COLOR-BAR GENERATOR
USE: for checking overall operation of color-TV receivers and a "must" for adjusting and trouble-shooting color phasing and matrixing circuits. Generates signals for producing 10 bars of different colors simultaneously. $295.50* (complete with cables, TV-input adapter, instruction book).

PLUS a complete line of test equipment accessories—video multimarkers, TV isotaps and bias supplies, various probes and cables including high-voltage types. Add "the professional's touch" to your service—see RCA's full line at your Authorized RCA Test Equipment Distributor!

*User Price (Optional)

RCA
RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.

Reps & Distributors

NEDA is now making distribution of the 1959 NEDA Battery Index.

WATERS MANUFACTURING INC. has appointed FARWEST AGENCIES as its rep in Wash. and Ore.

SILICON TRANSISTOR CORP. has named the JACK BERMAN CO. their rep in S. Calif. and Ariz.

HENRY LAVIN ASSOC., manufacturer's rep, has been joined by LEONARD G. EVANS.

LAND - C - AIR SALES CO. has opened a new branch office at 328 Springfield Ave., Summit, N.J.

HARRY ESTERSOHN, manufacturers rep, has moved to larger quarters at 5727 Wister St., Philadelphia 38, Pa.

RADIART CORP. is being represented by MICHAEL A. LIMANNI CO., in Me., N.H., Vt., R.I., Conn. and Mass.

IRC reports the appointment of ELECTRONIC COMPONENT SALES, INC. as its rep in the Rocky Mountain territory.

ORR INDUSTRIES, INC. has appointed the R. W. MITSCHER CO., INC. as the new Irish Tape rep for upstate N.Y.

AMPEX CORP. has been appointed sole authorized distributor in the U. S. of Marconi television cameras, television equipment and broadcasting equipment.

SNYDER MFG. CO. announced the appointment of MARTY MARGOLIN to sell Snyder products exclusively on the East Coast, including Philadelphia, the New England area and N.Y. state.

COLMAN ELECTRONIC PRODUCTS, INC. reports the appointment of SINGER PRODUCTS CO., INC., N.Y., as its rep to manage its foreign activities and interest.

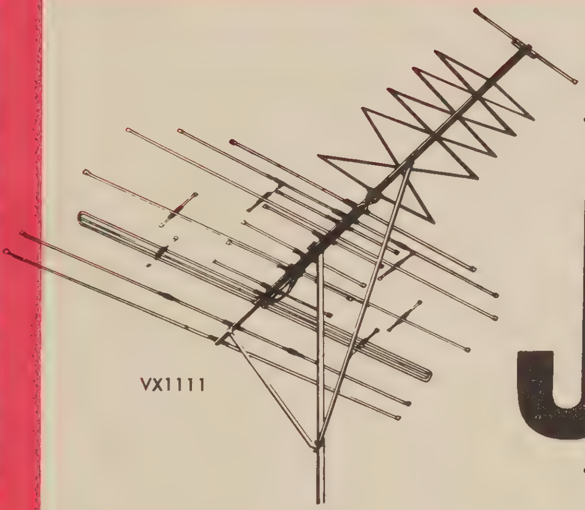
MOTOROLA COMMUNICATIONS & ELECTRONICS, INC. has named four manufacturer's reps as follows: WALLACE & WALLACE, Los Angeles; SAFFRO & Assoc., Chicago; MEMO, INC., Hempstead, N.Y.; and THE REPRESENTATIVES CORP., Boston.

ELECTRONIC REPS. ASSN. has established a Business Management Committee to study costs involved in the operation of an electronic representative agency and to provide ERA members with statistics by which they can determine their own position with respect to overall averages. PHILIP M. ANDREW of ANDCO SALES-ENGINEERING, Philadelphia, is Chmn. of the group.

be sure to watch

ALCOA PRESENTS

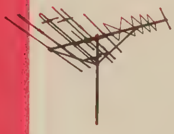
on Tuesday,
November 10
10:00-10:30 pm
Eastern Time
on A•B•C TV



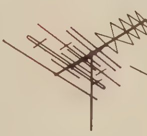
VX1111

when 50 million viewers from coast to coast will see and hear the dramatic new TV commercial featuring the

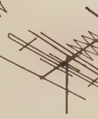
JFD SATELLITE-HELIX



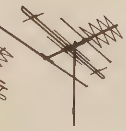
PX911



SX711



RX511



JX311

The spectacular TV antenna that

"shrinks the miles . . . flattens the mountains"

Made of corrosion-resistant, heavy duty Alcoa Aluminum that will withstand driving winds and heavy ice loads . . . and lasts . . . and lasts . . . and lasts . . .

station line-up ALCOA PRESENTS

State	Station	Channel	Local Time
ALABAMA			
Mobile	WALA-TV	10	10-10:30 PM (5-day delay)
ARIZONA			
Phoenix	KTVK	3	9-9:30 PM
Tucson	KGUN-TV	9	9-9:30 PM
ARKANSAS			
Little Rock	KATV	7	9-9:30 PM
CALIFORNIA			
Los Angeles	KABC-TV	7	10-10:30 PM
Sacramento-Stockton	KOVR	13	10-10:30 PM
San Diego	XETV	6	10-10:30 PM
San Francisco	KGO-TV	7	10-10:30 PM
COLORADO			
Denver	KBTV	9	9-9:30 PM
CONNECTICUT			
New Haven	WNHC-TV	8	10-10:30 PM
DISTRICT OF COLUMBIA			
Washington	WMAL-TV	7	10-10:30 PM
FLORIDA			
Jacksonville	WFGA-TV	12	10-10:30 PM
Miami	WPST-TV	10	10-10:30 PM
Orlando	WLOF-TV	9	10-10:30 PM
Tampa-St. Petersburg	WSUN-TV	38	10-10:30 PM
GEORGIA			
Atlanta	WLW-A	11	10-10:30 PM
IDAHO			
Boise	KTVB	7	10-10:30 PM (9-day delay)
ILLINOIS			
Chicago	WBKB	7	9-9:30 PM
Danville	WDAN-TV	24	10-10:30 PM
Decatur	WTVP	17	9-9:30 PM
Peoria	WTVH	19	9-9:30 PM
Rock Island-Davenport	WHBF-TV	4	10-10:30 PM (2-day delay)
INDIANA			
Evansville	WTVW	7	9-9:30 PM
Ft. Wayne	WPTA	21	9-9:30 PM
Indianapolis	WLW-I	13	10-10:30 PM
INDIANA, cont.			
Muncie	WLBC-TV	49	9-9:30 PM
South Bend	WSJV-TV	28	9-9:30 PM
IOWA			
Waterloo-Cedar Rapids	KCRG-TV	9	9-9:30 PM
Des Moines	WOI-TV	5	9-9:30 PM
KANSAS			
Hays	KAYS-TV	7	9-9:30 PM
Wichita	KAKE-TV	10	9-9:30 PM
Ensign	KTVC	6	9-9:30 PM
KENTUCKY			
Lexington	WLEX-TV	18	9-9:30PM (7-day delay)
Louisville	WHAS-TV	11	10-10:30 PM (3-day delay)
LOUISIANA			
Baton Rouge	WBRZ	2	10:30-11 PM (1-day delay)
New Orleans	WVUE	13	9-9:30 PM
MAINE			
Portland-Mt. Washington	WMTW-TV	8	10-10:30 PM
MARYLAND			
Baltimore	WJZ-TV	13	9:30-10 PM (1-day delay)
MASSACHUSETTS			
Boston	WHDH-TV	5	10-10:30 PM
MICHIGAN			
Detroit	WXYZ	7	10-10:30 PM
Flint	WJRT	12	10-10:30 PM
MINNESOTA			
Austin	KMMT	6	9-9:30 PM
Duluth	WDSM-TV	6	10:00-10:30 PM (4-day delay)
Minneapolis-St. Paul	WTCN-TV	11	9-9:30 PM
MISSISSIPPI			
Jackson	WLBT	3	9-9:30 PM (4-day delay)
Meridian	WTOK-TV	11	10-10:30 PM (6-day delay)
MISSOURI			
Kansas City	KMBC-TV	9	9-9:30 PM
Sedalia	KMOS-TV	6	9-9:30 PM
Springfield	KYTV	3	9:30-10 PM (9-day delay)
St. Louis	KTVI	2	9-9:30 PM
NEBRASKA			
Omaha	KETV	7	9-9:30 PM
NEVADA			
Las Vegas	KSHO-TV	13	9-9:30 PM (7-day delay)
NEW MEXICO			
Albuquerque	KOAT-TV	7	9-9:30 PM
NEW YORK			
Albany	WAST	13	10-10:30 PM
Buffalo	WKBW-TV	7	10-10:30 PM
New York	WABC-TV	7	10-10:30 PM
Syracuse	WSYR-TV	3	10-10:30 PM
Carthage-Watertown	WCNY-TV	7	9-9:30 PM (1-day delay)
NORTH CAROLINA			
Asheville	WLOS-TV	13	10-10:30 PM
Charlotte	WSOC-TV	9	10-10:30 PM
OHIO			
Cincinnati	WCPO-TV	9	10-10:30 PM
Cleveland	WEWS	5	10-10:30 PM
Columbus	WTVN-TV	6	10-10:30 PM
Dayton	WLW-D	2	10-10:30 PM
Lima	WIMA-TV	35	10-10:30 PM
Toledo	WSPD-TV	13	10-10:30 PM
Youngstown	WKST-TV	45	10-10:30 PM
OKLAHOMA			
Oklahoma City	KOCO-TV	5	9-9:30 PM
Tulsa	KTUL-TV	8	9-9:30 PM
OREGON			
Portland	KPTV	12	9-9:30 PM
PENNSYLVANIA			
Harrisburg	WTPA	27	10-10:30 PM
Lebanon	WLYH-TV	15	10-10:30 PM
Lock Haven	WBPZ-TV	32	10-10:30 PM
Philadelphia	WFIL-TV	6	10-10:30 PM
PENNSYLVANIA, cont.			
Pittsburgh	WTAE	4	10-10:30 PM
Wilkes-Barre	WNEP-TV	16	10-10:30 PM
York	WSBA-TV	43	10-10:30 PM
SOUTH DAKOTA			
Sioux Falls	KELO-TV	11	9:30-10 PM (9-day delay)
SOUTH CAROLINA			
Anderson	WAIM-TV	40	10-10:30 PM
TENNESSEE			
Chattanooga	WTVC	9	10-10:30 PM
Knoxville	WTVK	26	10-10:30 PM
Memphis	WHBQ-TV	13	9-9:30 PM
Nashville	WSIX-TV	8	9:30-10 PM (2-day delay)
TEXAS			
Amarillo	KVII-TV	7	9-9:30 PM
Dallas	WFAA-TV	8	9-9:30 PM
El Paso	KELP-TV	13	9-9:30 PM
Houston	KTRK-TV	13	9-9:30 PM
San Antonio	KONO-TV	12	9-9:30 PM
Nacogdoches	KTES	19	9-9:30 PM
UTAH			
Salt Lake City	KUTV	2	9-9:30 PM
VIRGINIA			
Lynchburg	WLVA-TV	13	10-10:30 PM
Norfolk	WAVY-TV	10	10-10:30 PM
Richmond-Petersburg	WTVR	6	10-10:30 PM
WASHINGTON			
Seattle	KING-TV	5	9-9:30 PM
Spokane	KREM-TV	2	9-9:30 PM
WEST VIRGINIA			
Charleston	WCHS-TV	8	10-10:30 PM
WISCONSIN			
Eau Claire	WEAU-TV	13	9-9:30 PM
Madison	WKOW-TV	27	9-9:30 PM
Marinette-Green Bay	WMBV-TV	11	9-9:30 PM
Milwaukee	WISN-TV	12	9-9:30 PM
WYOMING			
Casper	KTWO-TV	2	9-9:30 PM

IT PAYS
TO SPECIFY **JFD**

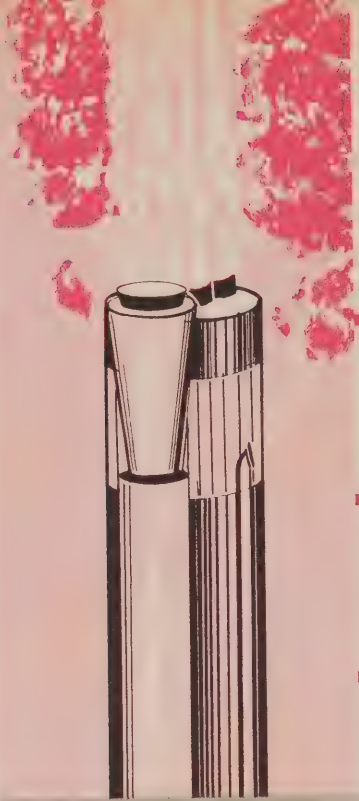
HI-FI HELIX COLORTENNAS

the TV antenna design America
knows best because it **performs** best!

In regular or gold anodized
ALCOA ALUMINUM

Satellite-Helix Power-Helix Star-Helix
Super-Helix Junior-Helix

AS FEATURED ON
ALCOA PRESENTS



BLAST OFF

TV antenna sales!

JFD ELECTRONICS CORPORATION
6101 Sixteenth Avenue • Brooklyn 4, New York

ELECTRONIC TECHNICIAN
Now Including
SERVICE
Magazine

Service Dealers Play Vital Role in Stereo Sales

Stereophonic sound has been given a rousing public reception. One year after substantial commercial introduction, we find the TV-radio service dealer becoming increasingly active in selling and installing stereo equipment.

Let's emphasize that we are referring to good quality stereo-high fidelity. The two words are not always synonymous. That is, high fidelity equipment can be either monophonic or stereo. Stereo equipment can either be high fidelity or a thoroughly inferior product.

There are several good reasons for service dealers to become active in hi-fi component sales.

First, stereo sales can be most profitable. They also tie the consumer more closely to the dealer for allied maintenance work.

Second, hi-fi components are technical products with specifications and ratings that are complex for most consumers. The customer needs a technician to provide the guidance and interpretation needed.

Third, from a geographic viewpoint, the service dealer is located in almost every town and city in the country, offering the consumer local service. For example ELECTRONIC TECHNICIAN subscribers are located in more than 10,000 different towns.

Survey Results

ELECTRONIC TECHNICIAN undertook two surveys last month, one covering service dealers, and the other consumers. Here are the results:

Hi-Fi Service Dealer Survey

1. Do you sell hi-fi components?
   YES—38.7% NO—61.3%
2. If yes, from whom do you buy hi-fi components?
   PARTS DISTRIBUTOR—77.1%
   MANUFACTURER—11.5%
   MAIL ORDER—4.9%
   HI-FI DEALER—6.5%
3. If you do not sell hi-fi components, do you believe customers are interested in buying hi-fi components?
   YES—38.0% NO—21.5% DON'T KNOW—40.5%
4. If your customers have indicated an interest in buying hi-fi components, are you interested in selling and installing them?
   YES—47.4% NO—27.6% UNDECIDED—25.0%
5. Where would you expect to buy hi-fi components?
   PARTS DISTRIBUTOR—73.2%
   MANUFACTURER—15.8%
   MAIL ORDER—6.1%
   HI-FI DEALER—4.9%

Hi-Fi Consumer Survey ($7500/year income)

1a. Do you now own a hi-fi package?
YES—36.6% NO—63.4%
b. How much did you pay? AVERAGE—$344
c. What type of store did you purchase it from?
MUSIC STORE—34.4%
APPLIANCE-TV DEALER—22.0%
DEPARTMENT STORE—21.6%
DISTRIBUTOR—15.6%
TV-RADIO SERVICE DEALER—3.3%
FURNITURE STORE—3.1%

2a. Do you now own hi-fi components?
YES—40.2% NO—59.8%
b. How much did you pay? AVERAGE—$407
c. What type of store did you purchase the components from?
HI-FI SALON—30.6%
ELECTRONIC DISTRIBUTOR—24.5%
MAIL ORDER—16.2%
TV-RADIO SERVICE DEALER—14.3%
DEPARTMENT STORE—4.3%
MUSIC STORE—3.9%
APPLIANCE-TV DEALER—2.2%
PHOTOGRAPHY STORE—2.0%
PRIVATE PARTY—2.0%

3. Assuming you bought hi-fi components, would you have a service technician install them or do it yourself?
DO IT MYSELF—48.1%
SERVICE TECHNICIAN—41.5%
UNDECIDED—10.4%

STEREO 1960

Last year's special feature, STEREO 1959, was well received by our readers. We are especially pleased that it won the equivalent of the "Oscar" or "Emmy" award—the Industrial Marketing Editorial Achievement Award for the best trade magazine issue of 1958.

We have completely revised last year's feature, reviewed progress during this first year of stereo, and have included the latest stereo new products in the catalog section.

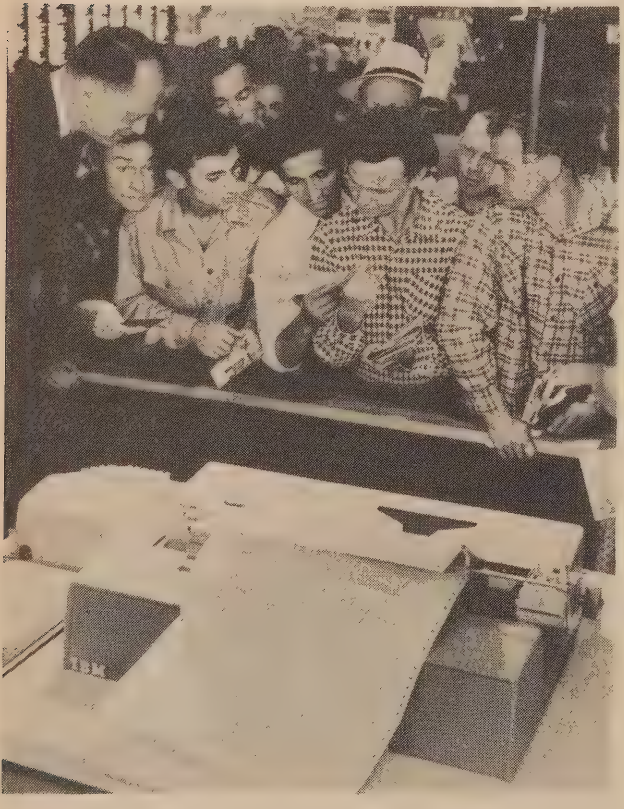
STEREO 1960 starts on page 85. If you are interested in selling stereo and desire additional information on the product lines, the editors will be pleased to offer their suggestions.

Tuning In the

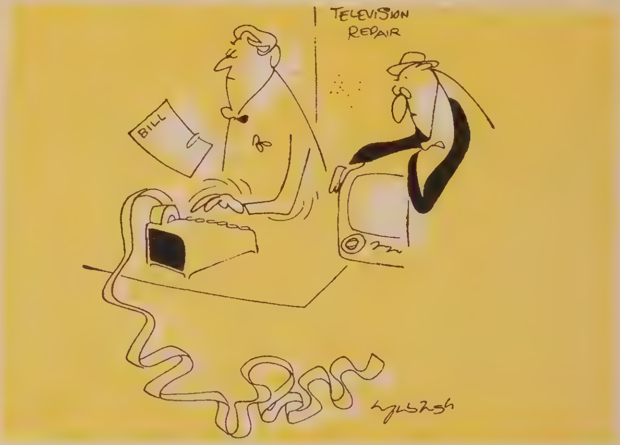
TUNNEL DIODE developed by General Electric and based on a principle noted by a Japanese scientist, is said to be an improvement or possible replacement for transistors. It is reported to be cheaper to make, and can be made smaller than transistors, too. Applications include battery operated TV, miniature FM receivers and specialized devices for industry and government. Tunnel diodes will oscillate above 2000 mc and produce less noise than transistors. Power requirements are one millionth of a watt, which is on the order of one thousandth of the power transistors require.

SOVIET EXHIBITION in New York (see page 92 August 1959 ELECTRONIC TECHNICIAN*) included a TV receiver bearing the name "Admiral." The Chicago based manufacturer of the same name protested, and the Russians—showing more cooperation than they ever did at Geneva—promptly withdrew that particular set from the show.*

COMPUTER ENTRANCES RUSSIANS



Russian visitors to the American National Exhibition in Moscow crowd around the "Electronic Encyclopedia" to ask questions about life in the U.S. The IBM RAMAC 305 computer prints out answers in Russian to any of 4,000 different questions. The most popular question related to the price of U.S. cigarettes.



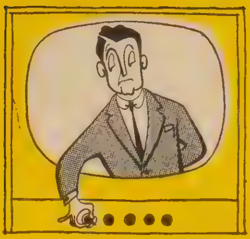
AVERAGE TV PRICE is heading upward, reports TV Digest. *Despite the modest climb from the 1956 low, TV sets with their technical improvements and larger pictures are still selling for less than one-half of what they were in 1947. Here is a recapitulation of the average factory TV set price year by year from 1947 through 1958.*

1947	*$280*	*1953*	*$170*
1948	*$235*	*1954*	*$140*
1949	*$193*	*1955*	*$138*
1950	*$180*	*1956*	*$127*
1951	*$177*	*1957*	*$130*
1952	*$172*	*1958*	*$136*

AIRCRAFT DIRECTION-FINDING system demonstrated by ITT is capable of measuring the direction from which a radio signal is being transmitted within an accuracy of ± 1°. The system consists of an array of stationary antennas arranged in a circle. By electronically comparing the signal received by each antenna, the direction of arrival of the radio wave is determined. The output of each antenna is commutated to provide a sampling every 0.001 second.

MULTIPLE CIRCUIT ANALYZER developed by Consolidated Avionics automatically tests as many as 2000 two-terminal circuits in a predetermined sequence, prints out the type of failure when a defective circuit is located. For the increasingly complex industrial and military electronic equipment, technicians will apparently rely more and more on master testing apparatus. The analyzer uses 28 volt d-c to measure resistances. The time required for each circuit check is from 0.1 to 10 seconds. An interesting feature of the device is a shelf-checking test after each step. If the analyzer cannot pass its own test, it automatically stops.

Picture ....



ELECTRONIC RETICLE for cathode ray pickup tubes has been developed by Grimson Color, N.Y.C. Distinct from the familiar hairline reticle of optical systems, the electronic reticle appears on the monitor screen as a sharply defined marking. Being etched on the vidicon faceplate, the reticle lines are in the same focal plane and are therefore transmitted simultaneously with the televised scene.

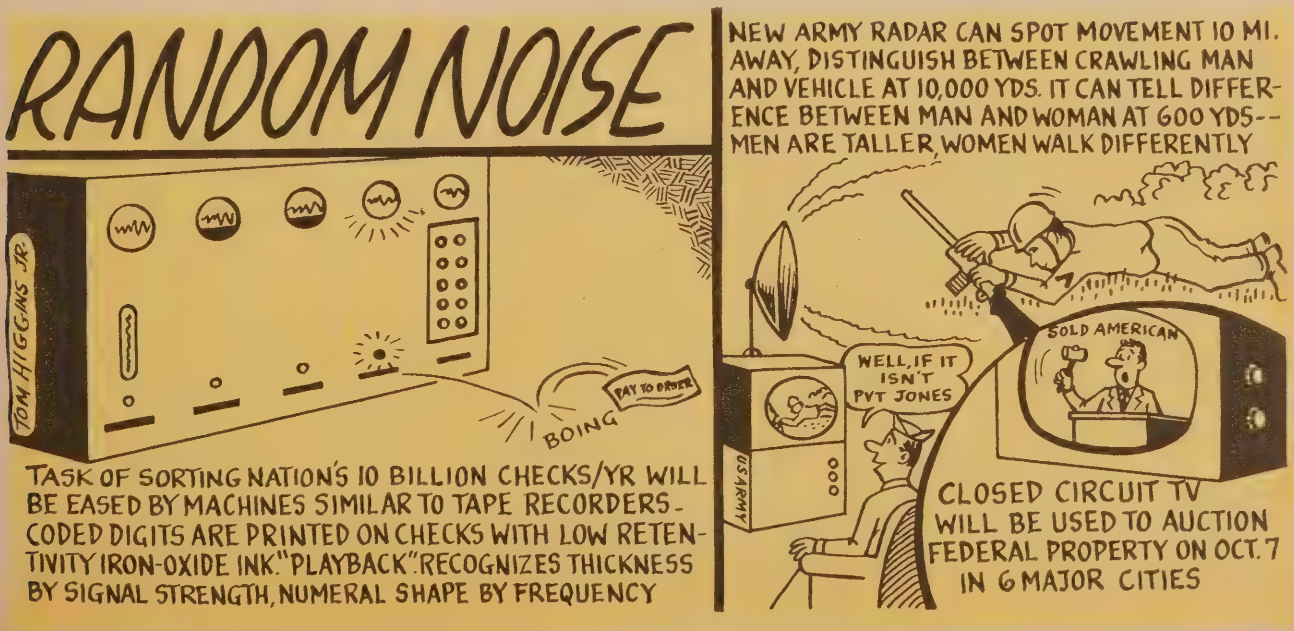
FEDERAL TRADE COMMISSION has charged Midwest Electronics Corp., 2322½ Big Bend Blvd., St. Louis, Mo. with using exaggerated earnings claims and other misrepresentation to sell its electron tube testing devices, tubes and related supplies. The FTC complaint alleges that consumers have been misled by the concern's advertising and salesmen. For example, the complaint charges that purchasers investing $2,923.25 will not make $650 a month or proportionate amounts on smaller or larger investments, but their actual returns are appreciably smaller. The complaint notes that the firm has also used the name Nation Wide Sales Co.

FCC has concluded a study which indicates that there are adequate frequencies above 890 mc to take care of both common carriers and private users of point-to-point communications. It is not believed that licensing private communications systems would substantially affect the ability of common carriers to provide service to the public. The significance of these conclusions is that microwave relay above 10,000 mc will probably find increasing inclusion in the Business Radio Service. With more private microwave systems in use, independent communication service companies will find growing opportunities.

CALENDAR OF COMING EVENTS

Sept. 21-25:	Instrument Society of America, International Conference and Exhibit, International Amphitheatre, Chicago, Ill.
Sept. 30-Oct. 1:	Industrial Electronics Symposium, Mellon Institute, Pittsburgh, Pa.
Oct. 2-4:	First Annual Stereo & Hi-Fi Show in Spokane, Wash. Davenport Hotel.
Oct. 5-7:	Fifth National Communications Symposium, Hotel Utica, Utica, N. Y.
Oct. 5-10:	1959 New York High Fidelity Music Show, New York Trade Show Bldg., New York, N. Y.
Oct. 7-9:	IRE Canadian Convention & Exposition, Exhibition Park, Toronto, Canada.
Oct. 12-15:	National Electronics Conference, Sherman Hotel, Chicago, Ill.
Oct. 15-18:	Texas Electronics Assn., Houston Chapter, Rice Hotel, Houston, Texas.
Oct. 26-28:	East Coast Aero & Navigation Electronic Conference, Lord Baltimore Hotel, Baltimore, Md.
Oct. 28-29:	Michigan Industrial Electronics Exposition, Detroit Artillery Armory, Oak Park, Mich.
Oct. 29-31:	1959 Electron Devices Marketing, Shoreham Hotel, Washington, D. C.
Nov. 3-5:	MAECON (Mid-America Electronic Convention), Municipal Auditorium & Hotel Muehlebach, Kansas City, Mo.
Nov. 4-6:	National Automatic Control Conference, New Sheraton Hotel, Dallas, Texas
Nov. 9-11:	Radio Fall Meeting, IRE-EIA, Syracuse Hotel, Syracuse, N. Y.
Nov. 9-11:	Fourth IRE Instrumentation Conference and Exhibit, Atlanta Biltmore Hotel, Atlanta, Ga.

FACTORY SERVICE operations have been dropped by Westinghouse TV-Radio Set Division. The company reportedly will work exclusively with independent service technicians. Also, independent electronic parts jobbers will be franchised to supply parts in those areas not served by regular company parts depots.


RANDOM NOISE
TOM HIGGINS JR.
PAY TO ORDER
BOING
TASK OF SORTING NATION'S 10 BILLION CHECKS/YR WILL BE EASED BY MACHINES SIMILAR TO TAPE RECORDERS-CODED DIGITS ARE PRINTED ON CHECKS WITH LOW RETENTIVITY IRON-OXIDE INK. "PLAYBACK" RECOGNIZES THICKNESS BY SIGNAL STRENGTH, NUMERAL SHAPE BY FREQUENCY
NEW ARMY RADAR CAN SPOT MOVEMENT 10 MI. AWAY, DISTINGUISH BETWEEN CRAWLING MAN AND VEHICLE AT 10,000 YDS. IT CAN TELL DIFFERENCE BETWEEN MAN AND WOMAN AT 600 YDS-- MEN ARE TALLER, WOMEN WALK DIFFERENTLY
WELL, IF IT ISN'T PVT JONES
US ARMY
SOLD AMERICAN
CLOSED CIRCUIT TV WILL BE USED TO AUCTION FEDERAL PROPERTY ON OCT. 7 IN 6 MAJOR CITIES

Unloading The Flyback

Practical TV Servicing Approach To Horizontal Output Transformers

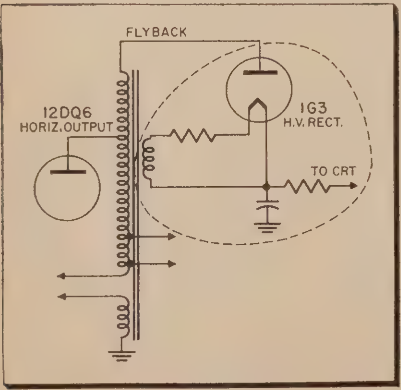
ROBERT CORNELL

• Rapid troubleshooting of a complex TV receiver is dependent upon the technician's ability to quickly isolate the trouble to a small portion or section of the set. Even when a defective stage has been found, continued isolation by process of elimination procedures will help pinpoint a defective component. Two ways to conclusively check out a part is either to test it or substitute a known good unit.

Inventory

Capacitors and resistors present no unusual problems, as most shops maintain a fairly good supply, but when it comes to inductors and transformers the headaches begin. Many shops have a small supply of the more popular inductive components, either because they recognize the need for them, or perhaps because replacements were purchased for other repair jobs and then found that they weren't needed in the first place. However, the almost infinite number of differences in inductive components, both electrically and mechanically, make it impractical to maintain a complete stock. Substitution, therefore, is usually eliminated as one of the two methods of checking a horizontal output transformer (H.O.T.) since it is normally not stocked. Because of this, replacement of H.O.T.'s presents many difficulties.

Fig. 1—The circuit following the H.O.T. shouldn't adversely affect high voltage if only a small, or no spark can be drawn from the 1G3 and, removing the cap lead, a spark can't be drawn directly from the lead.



Troubleshooting

Even if a transformer was available, some H.O.T's are located in almost inaccessible positions. In addition, the number of leads connected to it prompts the technician to think twice before substituting another flyback. Considering the aforementioned drawbacks, the only alternative is to test it when the flyback is suspect. But how? Let's take it from the beginning and consider a typical complaint of "sound, but no raster." A logical troubleshooting approach might be as follows:

(1) Visual check of tube heaters shows all to be functioning, with the possible exception of the high voltage rectifier tube, which may or may not be visible even if lit.

(2) Using an insulated screwdriver, try to draw an arc from the top of the high voltage rectifier tube, only to find a very small spark, or no spark at all.

(3) Remove the cap lead from the high voltage rectifier tube and try to draw an arc directly from the lead. Once again, no spark. It can now be assumed that the circuit following the high voltage transformer, the rectifier and its components, are not preventing the high voltage from being developed. See Fig. 1. (Had the high voltage come to life with the lead off, it would have indicated trouble in the tube, or high voltage circuits following the tube.) Replace the cap lead.

H.O.T. SERVICING

Techniques
- **Isolation**
- **Unloading**
- **Substitution**

Deflection Circuits
- **Yoke**
- **Damper**
- **Width Coil**

Rectifier Circuits

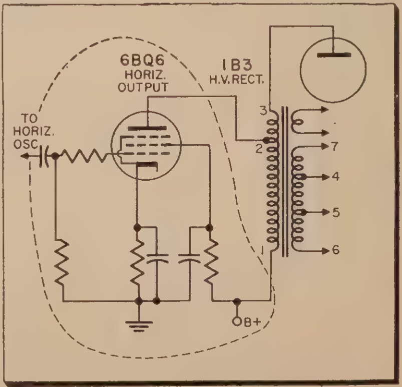
Drive Circuits
- **Oscillator**
- **Power Amplifier**

Piggyback Circuits
- **AFC**
- **AGC**
- **Boost**

Test Instruments
- **VTVM**
- **Scope**

(4) At this point it is usual to hope that the trouble is in the circuits before the output transformer, if for no other reason than that they are easier to check than the flyback itself. Red hot plates in the horizontal output tube may indicate an absence of drive, or an excessive cur-

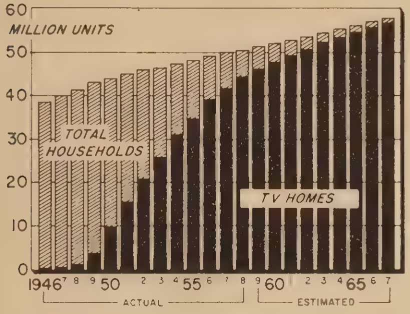
Fig. 2—Eliminating the drive circuits prior to the H.O.T. as a possible cause of impaired high voltage is an important step to be taken before considering a new H.O.T.



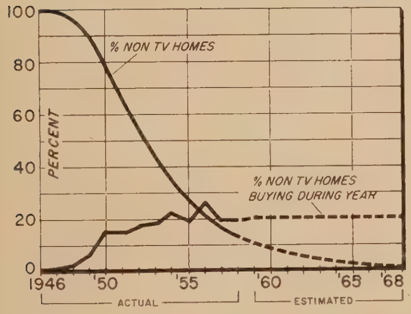
The Electronic Industry

Shows Continued Growth In Sales And Service

Total U.S. Households and TV Rooms



TV Saturation



Receiving and Picture Tube Sales

Renewal Market (000,000)

	Receiving Tubes	Total TV Picture Tubes	Total Renewal
1940	$ 10.2	$ —	$ 10.2
1950	45.8	14.9	60.7
1952	60.4	39.5	99.9
1954	89.7	81.8	171.5
1956	134.6	118.8	253.4
1957	156.8	123.4	280.2
1958	149.3	123.5	272.8
1959 J	165.6	123.7	289.3
1960 J	173.2	135.1	308.3
1963 J	185.2	159.6	344.8
1966 J	193.5	187.7	381.2
1968 J	199.1	210.3	409.4

J - Projection

(Continued on page 60)

TV Sets In Use (E.O.Y.)*

By Screen Size — By Year Cumulative (% of Total)

Years	15" & Less	16" - 18"	19" - 21"	22" & Over	Color	Total
1948	100.0%	— %	— %	— %	— %	100.0%
1949	100.0	—	—	—	—	100.0
1950	66.4	30.5	3.1	—	—	100.0
1951	43.3	50.0	6.7	—	—	100.0
1952	30.7	49.9	19.4	—	—	100.0
1953	22.3	45.5	31.6	.6	—	100.0
1954	15.9	39.7	42.9	1.5	—	100.0
1955	10.9	33.8	52.1	3.0	.2	100.0
1956	10.4	30.0	55.0	4.2	.4	100.0
1957	9.1	27.5	57.9	4.9	.6	100.0
1958	8.1	26.5	59.5	5.0	.9	100.0

* - End of Year

"Life" Study of Consumer Expenditures

Radios, TV Sets, Phonographs

By Annual Household Income

Annual Household Income	# Households (000)	$ Expend. per Household	Total $ Expend. (000,000)	% of Total	% of Total Family Expend.	% of Total Households
Under $2,000	8,610	$ 21	$ 180.8	9%	1.1%	17.5%
$2,000 - $2,999	7,080	39	276.1	13	1.3	14.4
$3,000 - $3,999	7,510	53	398.1	19	1.4	15.3
$4,000 - $4,999	9,250	44	407.0	20	1.0	18.8
$5,000 - $6,999	9,680	47	455.0	22	.9	19.7
$7,000 - $9,999	4,680	45	210.6	10	.7	9.5
$10,000 or More	2,330	61	142.1	7	.8	4.8
Total All Households	49,140	$ 42	$2,069.6	100%	1.0%	100.0%

Power and Transmitting Tubes

Renewable Market (Thousands of Dollars)

	High Vacuum Tubes	Gas & Vapor Tubes	All Other Tubes	Total
1951	$6,025	$3,249	$ 931	$10,205
1952	5,463	2,855	835	9,153
1953	5,350	3,083	1,024	9,457
1954	5,923	3,075	389	9,386
1955	6,332	3,507	789	10,629
1956	6,330	3,899	1,664	11,893
1957	6,404	3,736	5,244	15,384
1958	6,221	3,455	8,341	18,124

Source: NEMA and EIA Statistical Department—Member Reports Only—Total Industry Probably Somewhat Higher.

Modules For Electronics

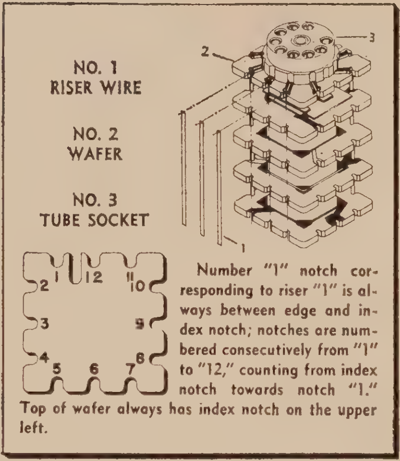
Multi-Component Units Speed Radio-TV Troubleshooting

Allan Lytel

• For the service technician, modules mean easier servicing. They contain the required circuit values within a compact unit. Each module is, in effect, a complete electronic stage and from a service viewpoint, should be considered a single component.

Modular Contruction

Modular construction is achieved by attaching miniature components on individual ceramic type wafers. The wafers are then stacked and electrically and mechanically attached by twelve risers. These interconnecting vertical wires are accommodated by each wafer through twelve notches. A locating notch, as seen in Fig. 1, may be found between the first and twelfth notch.



Number "1" notch corresponding to riser "1" is always between edge and index notch; notches are numbered consecutively from "1" to "12," counting from index notch towards notch "1." Top of wafer always has index notch on the upper left.

Fig. 1—Correct module mounting is simplified by a notch between risers 1 and 12.

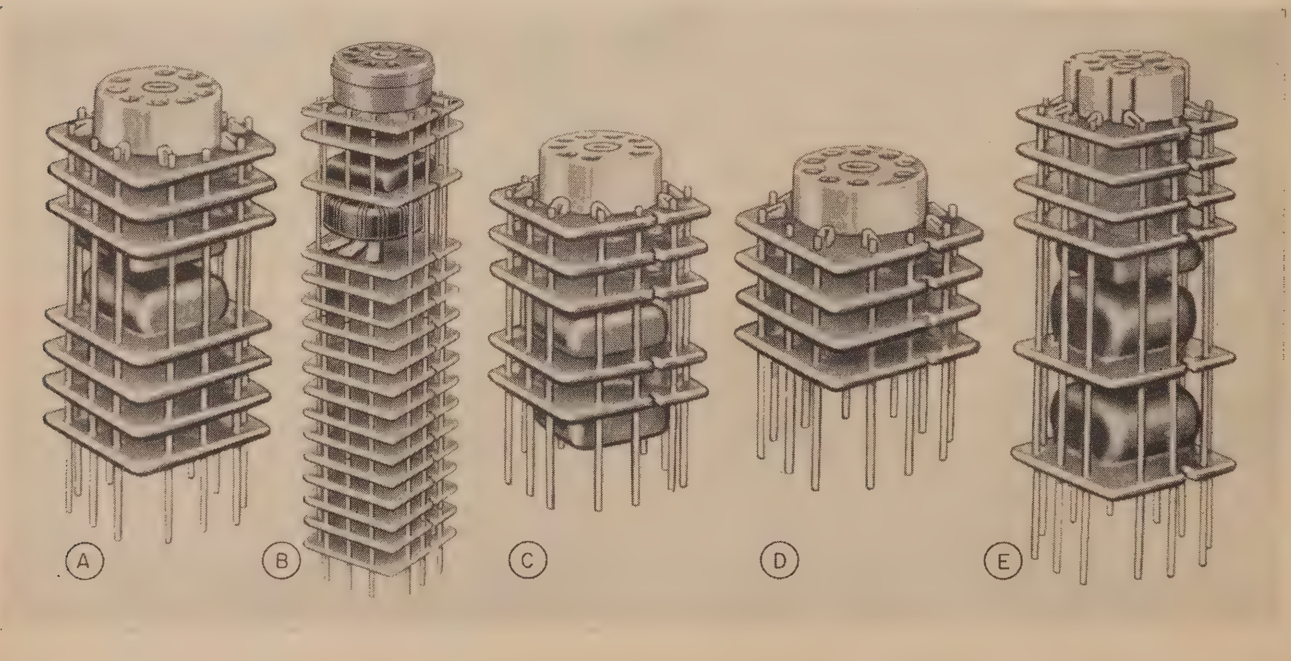
> *The development of modules represents another major step in the direction of light weight and compact products. Automation techniques are readily adaptable to module production, and show promise of reduced assembly costs. In view of this, technicians should familiarize themselves with modules . . . they'll be seeing more of them in TV, radio, hi-fi and industrial electronics.*

A plastic coating is usually applied that protects the entire assembly from dust and humidity and also increases the tensile strength of the connectors. The resultant effect is a small, rugged and light assembly that is adaptable to many circuitry uses.

Simplified Servicing

The design and construction of a typical TV set, containing over 585

Fig. 2—The circuits corresponding to modules shown above are as follows: Module A, cascode intermediate video amplifier, refer to Fig. 3; B voltage regulator, to Fig. 4; C cathode mixer, to Fig. 5; D, multivibrator, to Fig. 6; E, low-level video amplifier to Fig. 7.



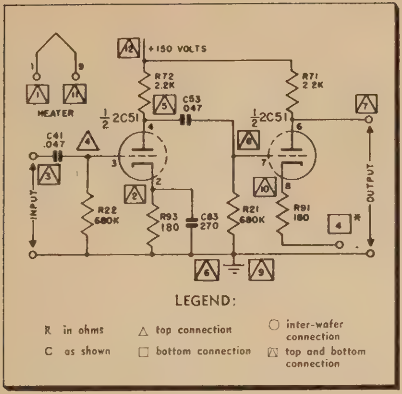

+150 VOLTS
R72 2.2K
R71 2.2K
C53 .047
HEATER
½2C51
½2C51
C41 .047
INPUT
R22 680K
R93 180
C83 270
R21 680K
R91 180
OUTPUT
LEGEND:
R in ohms
C as shown
△ top connection
□ bottom connection
○ inter-wafer connection
top and bottom connection

Fig. 3—The legend accompanying the intermediate video amp module (Fig. 2A) circuit aids in identification of riser terminals.

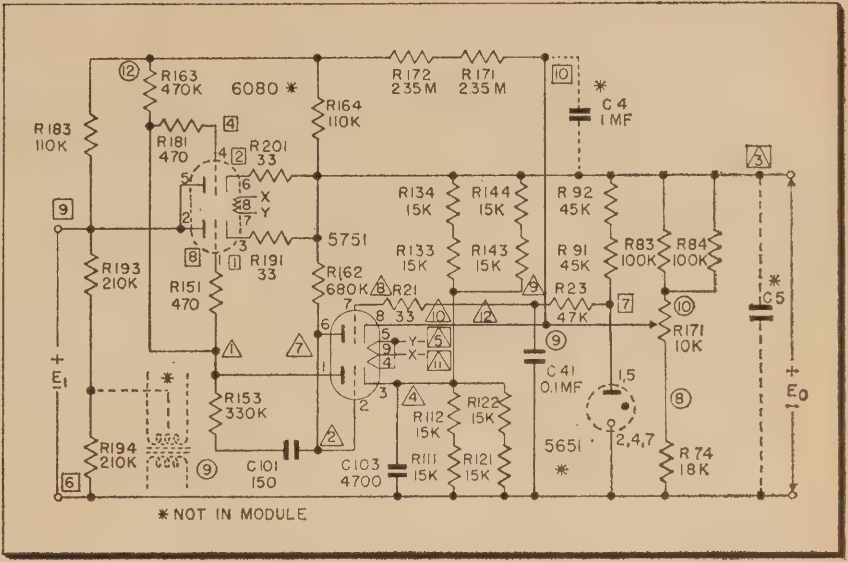

R163 470K
6080 *
R164 110K
R172 2.35 M
R171 2.35 M
C4 1 MF
R183 110K
R181 470
R201 33
R134 15K
R144 15K
R 92 45K
5751
R133 15K
R143 15K
R 91 45K
R83 100K
R84 100K
R193 210K
R151 470
R191 33
R162 680K
R21 33
R23 47K
R171 10K
C5
E1
C 41 0.1MF
R153 330K
R122 15K
R112 15K
5651 *
1,5
2,4,7
R 74 18K
E0
R194 210K
C101 150
C103 4700
R111 15K
R121 15K
*NOT IN MODULE

Fig. 4—The voltage regulator circuit illustrated has a 300 v d-c input between terminals 6 and 9. The tube socket and most of the components are on the module shown in Fig. 2B.

separate parts, can be greatly simplified by using modules. 200 separate resistors, capacitors and inductors may be replaced by 20 modular units that will substantially decrease the number of potential trouble sources. With the exception of mechanical parts, movable parts, large components and units that emit considerable heat, the near future may see TV sets that are modulized as well as transistorized.

Reduction of components by using modules is a decided advantage for the technician. Although costing more than an individual component, the time saved in labor is invaluable. As an example, troubleshooting of ten circuit elements may be eliminated by the substitution of only one module section. Also, the incidence of in-the-home servicing will grow and consequently eliminate time-consuming and poorly compensated TV pickup and deliveries for shop work.

Module Application

A complete series of "standard" modules illustrate the range of different circuits which can be used with this technique. Some of these modules (Fig. 2) and their corresponding circuits are as follows:

A Cascade Intermediate Video Amplifier as shown in Fig. 3. Note from the legend that components connect to the risers and the riser connections are available from the bottom, top, or both as indicated. This circuit uses both halves of the double triode 2C51. It is used to amplify video signals of an intermediate level. With a 0.5 v input the output is 16.0 v. From the schematic, the input is between risers 3 and 6 (or 9). Output for two stages is taken from riser 7. All of these are available from both the top and the bottom. Note that riser 4, a bottom connection only, is floating. This can be connected directly to ground, for a gain of 32, or a variable resistance can be connected between 4 and ground as a gain control.

A voltage regulator in Fig. 4 is used as a source for a steady 300 v d-c supply. The tube socket and most of the components are in the module but some of them, as indicated by an asterisk, are mounted externally. The control, R171, is mounted in the module and connected between risers 8 and 10 as an internal connection. This control is not available from either the top or bottom connections of the risers

A Common Cathode Mixer circuit, shown in Fig. 5, is used to combine positive video signals or as a cathode follower circuit. Fig. 6 illustrates a

(*Continued on next page*)

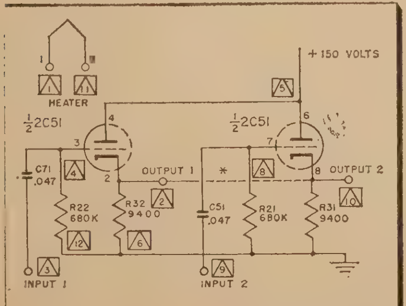

+150 VOLTS
HEATER
½2C51
½2C51
C71 .047
OUTPUT 1
*
OUTPUT 2
R22 680K
R32 9400
C51 .047
R21 680K
R31 9400
INPUT 1
INPUT 2

Fig. 5—A cathode follower circuit is self-contained on a single module. (See Fig. 2C).

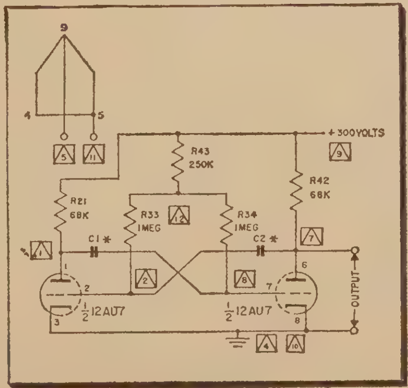

+300VOLTS
R43 250K
R42 68K
R21 68K
R33 1MEG
R34 1MEG
C1 *
C2 *
½12AU7
½12AU7
OUTPUT

Fig. 6—Square waves for many purposes are generated by the multivibrator circuit shown. Capacitors C1 and C2 determine the pulse rate. The module is shown in Fig. 2D.

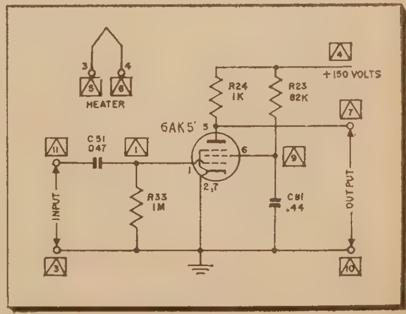

+150 VOLTS
R24 1K
R23 82K
HEATER
6AK5
C51 .047
R33 1M
C81 .44
INPUT
OUTPUT

Fig. 7—Low-level video signals are amplified by the circuit shown. A single pentode is used. The module is shown in Fig. 2E.

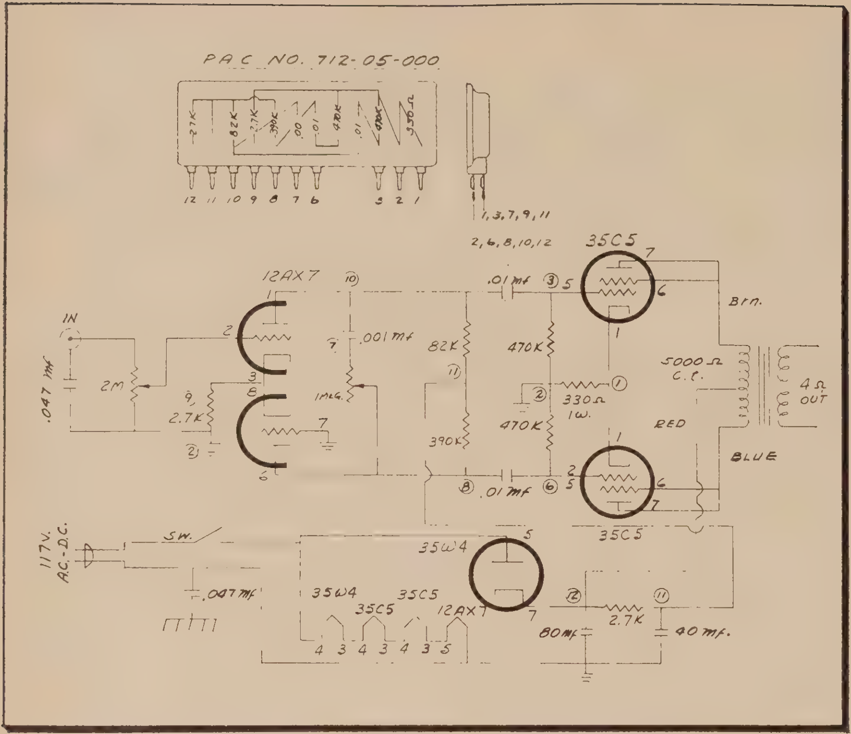

PAC NO. 712-05-000
27K
82K
2.7K
390K
.00
.01
47K
.01
470K
330Ω
12 11 10 9 8 7 6
3 2 1
1,3,7,9,11
2,6,8,10,12
35C5
12AX7
IN
.047 mf
2M
2.7K
.001 mf
1 MEG.
.01 mf
82K
470K
390K
330Ω 1W.
470K
5000Ω C.T.
Brn.
RED
BLUE
4Ω OUT
.01 mf
35C5
117V. AC-DC.
SW.
.047 mf
35W4
35W4
35C5
35C5
12AX7
4 3 4 3 4 3 5
2.7K
80 mf
40 mf.

Fig. 8—The amplifier circuit shown uses a flat-type module with 12 connections. The module connections are noted on the schematic by corresponding circled terminal numbers.

Multivibrator oscillator with a double-triode 12AU7 tube. The capacitors C1 and C2 determine the rate of the pulse output since R33 and R44 are fixed. This circuit is used to provide a square wave signal for many purposes.

Low-level video signals are amplified by the circuit in Fig. 7. With an input level of 0.6 v the output is 2.2 v; the limiting level is 4.2 v. A video signal is fed to the single pentode at riser 11 and taken out on riser 7.

A flat type module and its use in an amplifier circuit is shown in Fig. 8. Another circuit, using a module that is not stacked vertically is illustrated in Fig 9. This module is used as a clamped saturating common emitter stage with the clamping accomplished by a zener diode. Although other accessories and circuits are available, the modules noted are fairly representative of the existing modular circuits used today. Standardization will permit smaller stock of replacement modules for service purposes.

A TV set taking advantage of modules is shown in Fig. 10. Almost all the resistors and capacitors of the vertical and horizontal sweep circuits are included in only two modules. Several radios and TV sets have modular construction. Fig. 11 shows a radio layout using two modules; one r-f module and an a-f module. Most of the resistors and capacitors in the radio are to be found on these two modules.

Module Servicing

The construction of the module shown in Fig. 11 will aid in servicing. This diagram helps locate the parts on each of the modules. Note, for example, that the audio module has three decks or wafers. Components

(Continued on page 58)

Fig. 10—Most of the small components in the horizontal and vertical sweep sections of a Motorola TV chassis TS-556 are contained in two modules. The physical layout of components, riser numbers and locating notch of each module is shown next to the circuit in which it is used. Module riser numbers are also noted in the appropriate circuit diagram.

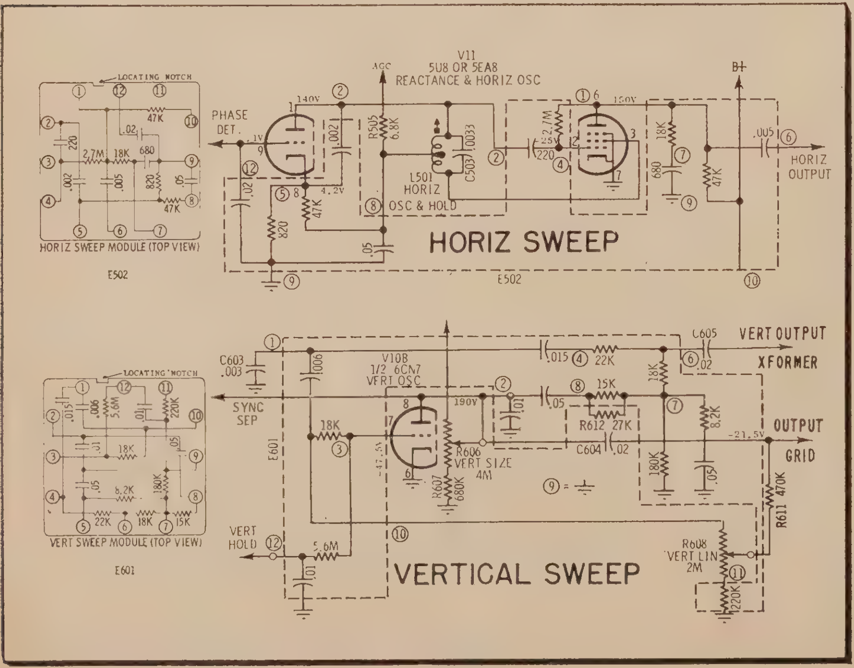
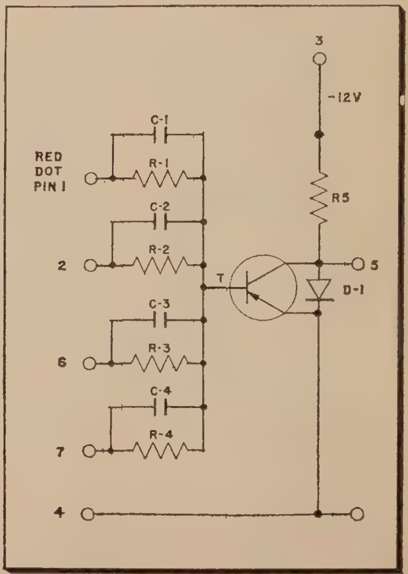
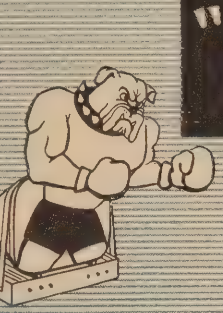

LOCATING NOTCH
HORIZ SWEEP MODULE (TOP VIEW)
E502
PHASE DET.
V11
5U8 OR 5EA8
REACTANCE & HORIZ OSC
AGC
B+
140V
150V
R505
L501 HORIZ OSC & HOLD
C503
2.7M
220
47K
680
820
18K
.005
HORIZ OUTPUT
HORIZ SWEEP
E502
LOCATING NOTCH
VERT SWEEP MODULE (TOP VIEW)
E601
C603 .003
SYNC SEP
V10B 1/2 6CN7 VERT OSC
190V
C605
VERT OUTPUT XFORMER
22K
15K
R612 27K
C604
R606 VERT SIZE 4M
R607 680K
18K
180K
8.2K
-21.5V
OUTPUT GRID
R611 470K
VERT HOLD
5.6M
R608 VERT LIN 2M
220K
VERTICAL SWEEP

Fig. 9—The clamped saturating common emittter stage illustrated below is contained in a single flat-type module. It is used as an ultra-fast transistor logic unit.


3
-12V
C-1
RED DOT PIN 1
R-1
R5
C-2
2
R-2
5
T
D-1
C-3
6
R-3
C-4
7
R-4
4



"Tough Dog" Corner

Difficult Service Jobs Described by Readers

Variable Capacitor Deforms Raster

I was recently called to service an old 16" metal tube RCA model T64. The complaint was an interference pattern that broke up all vertical lines or objects on both sides of the screen but the center of the raster was relatively unaffected. The sound was not impaired. Since the pattern was difficult to study with moving objects, I removed the 12AU7 video tube. The raster was full and evenly illuminated, though the interference pattern was still there. I therefore felt that the trouble wasn't in the video, r-f, i-f or detector circuits and mentally isolated the defect to the horizontal circuit. All tubes in the horizontal sweep and high voltage section were replaced without any change in the symptom.

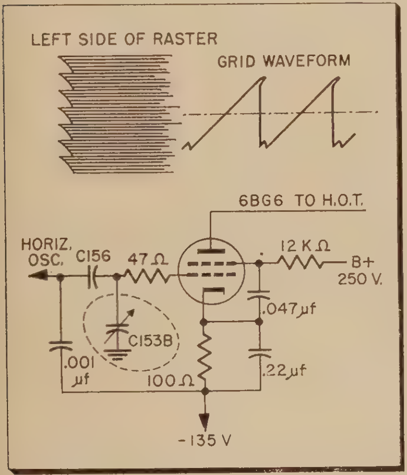


Fig. 1—A partially shorted drive capacitor produced a strange raster pattern that concentrated on the left side of the screen.

Taking another look at the schematic, shown in Fig. 1, I concluded that capacitor C156 was a good possibility for causing this difficulty and replaced it; without any discernable difference in the raster.

Voltage readings were all approximately correct, however, I felt that the fault was definitely in the horizontal sweep section and proceeded to adjust the drive trimmer, C153B. As I turned the trimmer, a slight change in the pattern developed into decreased width and then, a sudden clearing of the trouble. Removing the trimmer, I discovered a minute metal burr imbedded in the mica. Removal of the burr and a new mica strip corrected the complaint.—*M. G. Goldberg, St. Paul, Minn.*

Heater Affects Vertical Deflection

Answering a service call on a Philco 53-T2273, I was informed about insufficient vertical deflection and the excessive time it took to reach its maximum height. Calling on this home for the first time, I asked about any recent repairs and was told that a new vertical output transformer was recently replaced, together with a 12B4 tube. However, the original trouble was no vertical deflection at all.

After installing another tube without clearing the difficulty, I proceeded to take voltage readings. Plate voltage was near normal, but showed only a 2 volt drop across the transformer. Cathode voltage was too low, reading only 3 volts, while a high negative bias of 28 volts was noted. At this point another, and final, 12B4 tube was installed and I commenced checking the components in the vertical output area.

Not making any progress with the set, I let it play for awhile. After some time elapsed, I returned to the set and began some voltage checks once again. I noticed that the cathode voltage was taking an unusual amount of time to reach its mere 3 volts. But, the cathode resistor and bypass capacitor checked good for the second time.

Checking components off on my schematic, part of which is shown in Fig. 2, I mumbled to myself that everything had been inspected except for the tube's heater. Looking at the tube, I saw that it was lit and therefore probably good. Besides, this was the third tube I had in the socket. However, I decided to investigate further, since I ran out of any other ideas and the slow voltage rise on the cathode continued to bother me.

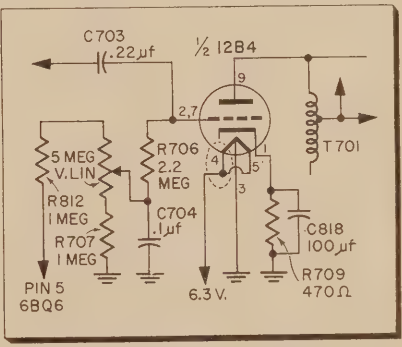


Fig. 2—Missing filament socket pin No. 4 cut the heater voltage in half and resulted in insufficient current flow. The inadequate current affected the TV set's height.

Pushing a 22 µµf capacitor aside to get to the heater pins, I was aston-

(Continued on page 74)

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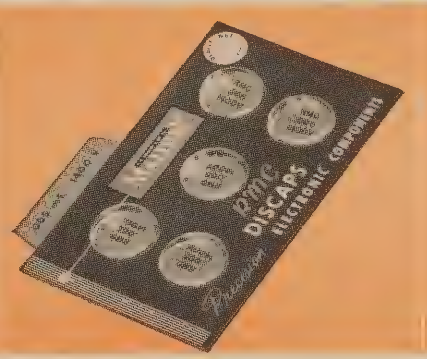

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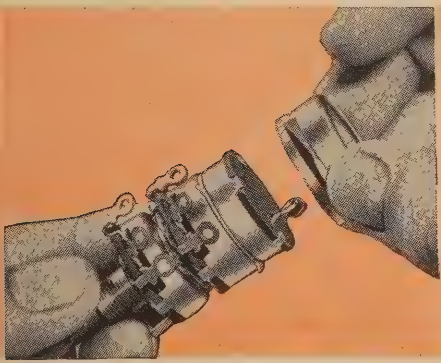

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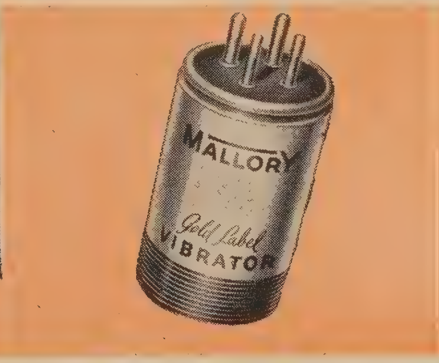

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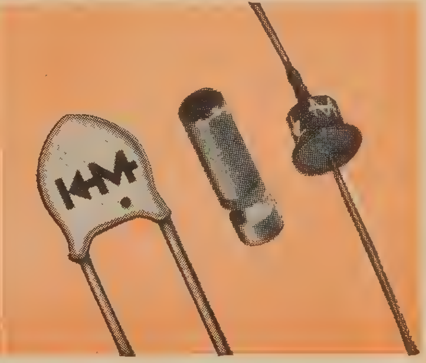

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Servicing Home Vacuum Cleaners

Don't Sell Vacuum Repairs Short. They're Simple And Profitable.

E. A. Mueller

Almost every TV set owner is a potential customer for vacuum cleaner repairs and maintenance. Vacuum cleaner servicing entails very little additional equipment and stock for a service technician. Local vacuum parts distributors can prove helpful in suggesting a basic parts inventory and price information to get you started in this allied service field.

• Vacuum cleaners offer a reasonably simple and well paying service field to the technician. Yet, it is usually neglected as a good source of income. Now that summer vacations are over, a big "cleaning season" is here. A few vacuum cleaner service tips will enable the electronic technician to extend his skills into this allied service field.

Two types of vacuum cleaners are on the market today; the tank or canister type and the upright type. The tank or canister cleaner, the most popular type, operates on the suction principle. This is in contrast to the upright vacuums which employ an air pocket and a revolving brush to agitate the carpet and loosen grit and dirt embedded in the nap of a rug. Tank cleaners, therefore, necessarily employ a much higher degree of suction than uprights.

Vacuum defects may be divided as follows: Bags and filters, switches and line cords, attachment parts and accessories and motors.

Bags And Filters

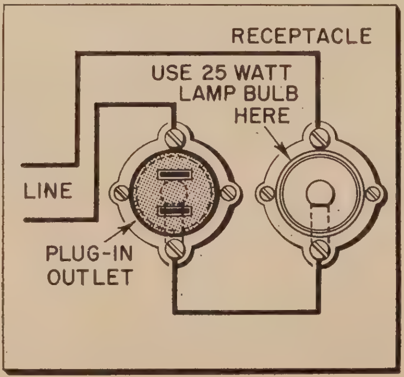
Most tank type cleaners are equipped with a cloth dust bag. Usually, a throw-away paper insert dust container is provided. A fresh paper insert is easily slipped into the cloth container. These paper inserts represent repeat business and bring customers into contact with other services offered.

The cloth dust bag, which can be in the form of a wool bat, fibre glass pad, fibre glass flocked screen, or special fabric, acts like a safety device. In the tank-type cleaner, unlike the upright, the air exhaust goes through the motor, and in the majority of cleaners, the filter is between the bag unit and the motor. Thus, if the bag unit is damaged, serious damage to the motor may result. Therefore, it is important to check the condition of the bag and filter because, in addition to a torn bag, dirt clogging may also damage the motor.

Flexible Hose

The flexible hose, used as the connector between the cleaner and cleaning tools, is susceptible to abnormal wear and unusual damage resulting in improper cleaner operation. In addition to normal wear, the following may occur: Damage by stepping on the hose or bending or kinking it too sharply. This breaks or flattens the coil wire support imbedded in the hose. Tearing or breaking loose of the lining of the hose—resulting in a valve-like closure of passage as soon as the power is turned on. Clogging of the hose—this is often caused by a needle, hairpin, or similar object becoming caught crossways in the hose and then building up a solid dam of lint, thread, and debris behind it. It may also be caused by picking up something too bulky to pass freely through the whole length of the hose such as a stocking, handkerchief, or even a wash cloth or dust rag.

Fig. 1—The series test light set-up shown reduces voltage to the vacuum cleaner motor and consequently slows down its speed for efficient "brush seating" applications.



None of these described damage causes are uncommon, and it is usually unwise to try to repair or unclog the hose in such cases since further damage may result. In almost every case the fabric or plastic hose is fastened to metal and connectors with wire supports and cement. It is possible to install a new hose part only on the old metal ends. To remove the metal ends from a damaged hose, cut the old hose through with a hacksaw about one inch away from the metal connector. Then, pull the cut end of the wire insert of the hose loose from the coupling. This will leave only the soft fabric or rubber remnants still cemented to the coupling which can be easily cut away after the wire support is pulled out. A new hose can be installed with gasket shellac or other bonding materials. Many shops, not wishing to bother with a hose repair, may trade the entire hose with its connectors for an exact replacement.

Attachments

It is important to check the amount of wear on the floating brush insert in the rug tool and also the oval bare floor brush and the round, long bristled dusting brush. Replace the brush insert or supply a new replacement tool when the amount of wear indicates inefficient operation. Also, examine the swivel joints on the floor tools because many styles are so constructed that excessive wear occurs in a comparatively short time, permitting air leakage and a resulting loss of suction at the nozzle opening.

Line Cords

A common cause of inoperative vacuum cleaners is a defective switch or line cord. Continuity checks with an ohmmeter will quickly determine if either is defective. A careful visual inspection of the line cord should also be made in the event of a break in the insulation that could cause intermittent operation or present a shock hazard.

It is advisable to maintain a line cord stock in "spools" rather than individual lengths. The usual size is #16-2 and #18-2 rubber covered wire. This will enable the technician to offer replacement line cords of any desired length to their customers. Spools are usually available in 100 ft. to 500 ft. rolls. Quantity purchases, of course, will result in a reduced purchase price for the technician.

Carbon Brushes

Vacuum cleaner motors are brush type motors with universal windings. Having this design, they will operate on either a-c or d-c current.

Carbon brushes can be an aggravating source of trouble if accumulation of carbon dust and oil prevents the brush from moving freely in its holder. To maintain good contact with the commutator of the armature, the carbon must be free so that the brush can hold it tightly against the commutator. Evidence of sticky carbons can be excessive sparking in operation although sparking is also a symptom of other problems. If the brush does not make proper contact it may prevent the motor from starting since it would simulate an open circuit.

Often, if a motor has been overloaded, the increased motor heat will take the temper out of the brush springs. This weakens the pressure contact and causes sparking. Replace carbon and spring if the spring temper is weak, or if spring has turned blue. Replace carbons which are worn or oil soaked. When replacing, be sure to clean the commutator and seat the new carbons with a honing stick. The honing stick, sometimes called a "brush seater," is a small brittle stick of white abrasive material. The honing operation can be done, in most cases, without taking the motor apart and often without removing the motor from the frame of the cleaner.

In an upright cleaner, remove the hood on late models to expose the commutator end of the motor. On earlier models, the commutator can be reached through vent openings at the commutator end of the motor shell. On tank type cleaners the commutator and brush area may be exposed by removing the motor and cover stamping.

Plug the motor cord into a series light outlet on test bench (see Fig. 1) and turn on the switch. Running through a series light, the speed of the motor will be comparatively slow, so that the honing stick can be efficiently applied to the commutator surface adjacent to the carbon contact point. Being abrasive, it will wear-in or smooth the commutator face so that the new carbons will seat without sparking.

If the sparking condition has existed too long, the groove or pitting in the commutator surface may be too deep to resurface with a honing stick. The condition may even be severe to the point of insulation burnout between copper bars of the commutator, or the heat of defective operation may have created a short or ground in the field coils or armature or both.

Don't overlook the possibility of worn brushes, which of course, should be replaced.

Field Coils

A practical "open" field coil test may be made by using the series lamp test set-up in Fig. 2. If the lamp does not light, then the coil has an open circuit. An ohmmeter test is not as accurate an indicator as the test lamp, since the fine wire of the field coil may only "break down" under current. Sometimes the open circuit occurs at the end leads connecting to the coil. A visual inspection will normally detect this break.

A shorted field coil will either blow a fuse or not produce a magnetic field strong enough to turn the armature. Sometimes the field is burned and therefore is easily recognized as defective. On other occasions, however, it may be shorted without any visual indications. It is then necessary to test the field coil with an ohmmeter (resistance test) or voltmeter (voltage drop test). In the latter test, comparing the voltage drop of one coil section with that of another one from the motor will indicate if a coil is defective, since all coils in a motor should have the same resistance and therefore the same voltage drop.

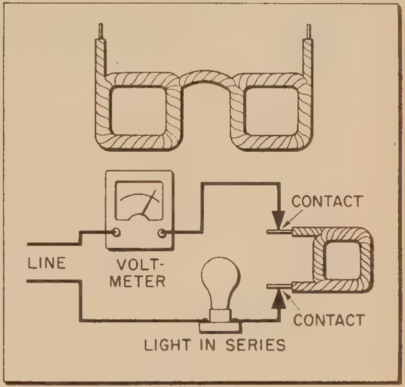


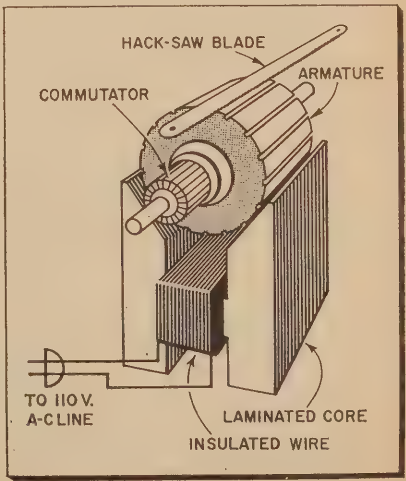
Fig. 2—Field coils may be accurately tested under operating conditions as illustrated.

Armature

A growler, shown in Fig. 3, is an indispensable test instrument for checking motor armatures. It is usu-

(Continued on page 74)

Fig. 3—The growler is an indispensable tool for testing armatures. If the hacksaw blade vibrates, it indicates that the coil in the slot under the blade is shorted.



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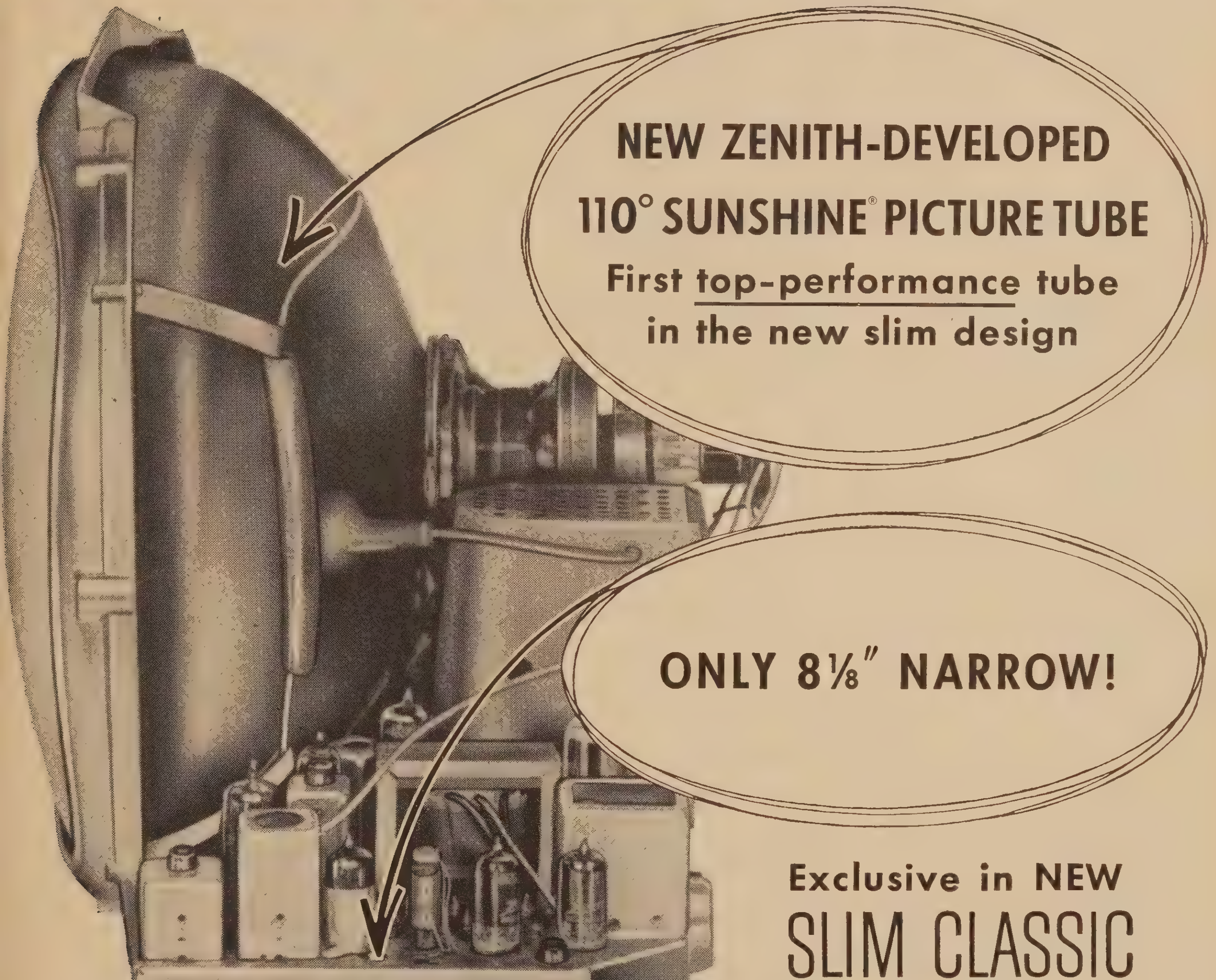

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SHOP HINTS

Tips for Home and Bench Service

Ammeter Test Aid

Many technicians use an ammeter to check circuit current before replacing a blown fuse or when troubleshooting in the event of a short. Also, ammeters are frequently used to monitor the current drawn by a set that has intermittent trouble; especially in the high voltage section.

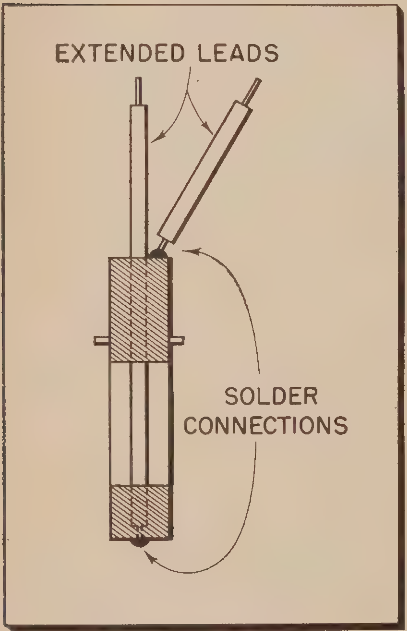

Fig. 1—Modified "twist-lock" fuses, as shown, will enable the technician to measure current without removing the TV chassis.

Meter test leads, although easily connected to the "snap-in" type fuse holders, cannot be connected to the new "twist-lock" fuse holders without first removing the chassis. The meter, however, can be connected without removing the chassis by modifying each "twist-lock" type fuse as shown in Fig. 1.

Carefully drill a small hole in each end of a "twist-lock" fuse and insert a short insulated lead into the "ear" end of the drilled hole. Maneuver the lead into the hole at the other end of the fuse and solder it. Then solder a short lead to the end having "ears", being careful that it doesn't short to the lead already installed.

This modified fuse may now be inserted into the set's "twist-lock" fuse holder and the meter leads connected to the extended wires. Since there are a few different type "twist-lock" fuses, it will be necessary to construct modified units to cover all needs.—*Albert J. Krukowski, West Springfield, Mass.*

Transistor Mounting

In many cases where the transistor is suspected as being defective, it must be unsoldered from the circuit for a final check or substitution. Whether it proved to be good or defective, either the old transistor or a new one must be replaced. If the area where the transistor mount is crowded with other parts, thereby making it impossible to hold the transistor while inserting it, try this suggestion: Wrap the top of the transistor with some tape, such as plastic electrical tape. This will make an easily held extension of the transistor height, as shown in Fig. 2. Tape only the top 1/8" of the transistor lightly, and then place it into its mounting holes. After soldering the leads in place, pull off the tape.—*Delco Radio Div., General Motors Corp.*

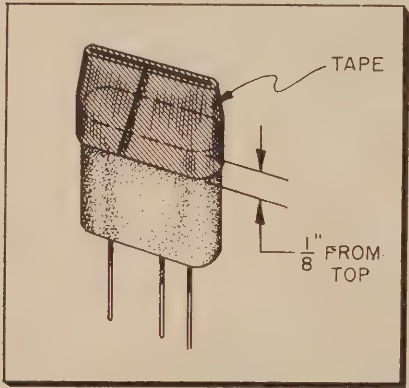

Fig. 2—Wrapping the top of a transistor with tape facilitates handling the component in almost inaccessible areas of small radios.

Parasitic Oscillations

The horizontal output stage of RCA series 800 TV portable receivers may develop parasitic oscillations. The oscillations can appear as a jagged or irregular vertical line on the right side of the picture when the width control is set to its maximum position. This can be remedied by inserting a 120 ohm resistor in series with the screen grid of the horizontal output tube, 17DQ6A, as shown in Fig. 3. This resistor will suppress the parasitic oscillations and provide for linear operation. When this condition exists, we also recommend that the 17DQ-6A's cathode resistor, 15 ohms, be checked at the same time for proper ground connection with the shortest possible lead.—*RCA Service Co., Camden, N. J.*

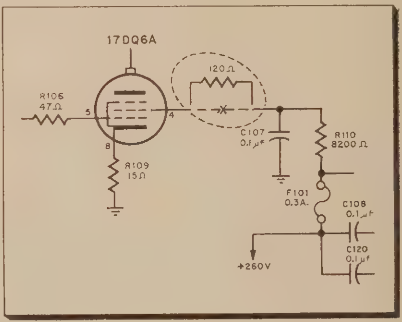

Fig. 3—Inserting a 120 ohm resistor in the 17DQ6A's screen grid of RCA series 800 TV sets will remedy parasitic oscillations.

SHOP HINTS WANTED!

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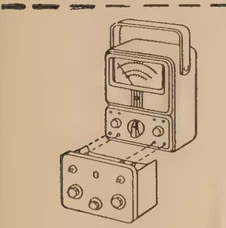

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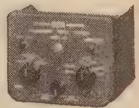

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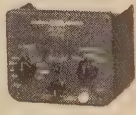
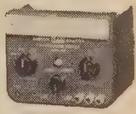
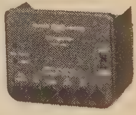


DC VTVM, Model 651................$32.95
Voltage Ranges: 0-.5/1.0/2.5/5.0/10/25/50/100/250/500
Accuracy: ±1%, with 260 ±3% (F.S.)
Input Impedance: greater than 10 megs all ranges



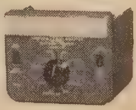
TEMPERATURE TESTER, Model 652....$38.95
Temperature Ranges: −50°F to +100°F, +100°F to +250°F
Accuracy: with 260 ±2° (nominal)
Three lead positions provided
Sensing Element: thermistor



AC AMMETER, Model 653............$18.95
Ranges: 0-0.25/1/2.5/12.5/25 amps
Accuracy: ±1%, with 260 ±3% nominal
Frequency Range: 50 cycles to 3000 cycles

AUDIO WATTMETER, Model 654......$18.95
Load Ranges: 4,8,16,600 ohms
Wattage: Continuous 25 watts (8,600 ohms)
50 watts (4,16 ohms)
Intermittent 50 watts (8,600 ohms)
100 watts (4,16 ohms)
Accuracy: ±5%, with 260 ±10% nominal
Direct reading scale from 17 microwatts to 100 watts

MICROVOLT ATTENUATOR, Model 655..$18.95
Ranges: 2.5 microvolts to 250,000 microvolts continuously variable in decade steps
Frequency: DC to 20 KC
Accuracy: ±1db



BATTERY TESTER, Model 656.........$19.95
Checks all radio and hearing aid batteries up to 90 volts at the manufacturer's recommended load, or any external load.

Note: All Simpson 260 Adapters provide for normal 260 usage without disconnecting the adapter.

GET BEHIND THE

SYLVANIA

$2. Combination

America's biggest magazines deliver this business-building offer to over 100 million readers!

Courier Express
Parade
Will success spoil Shirley MacLaine?
How to add $100 or more to the value of your TV set
SYLVANIA
GOOD FOR 6 MONTHS
$200
TV Guide
Reader's Digest

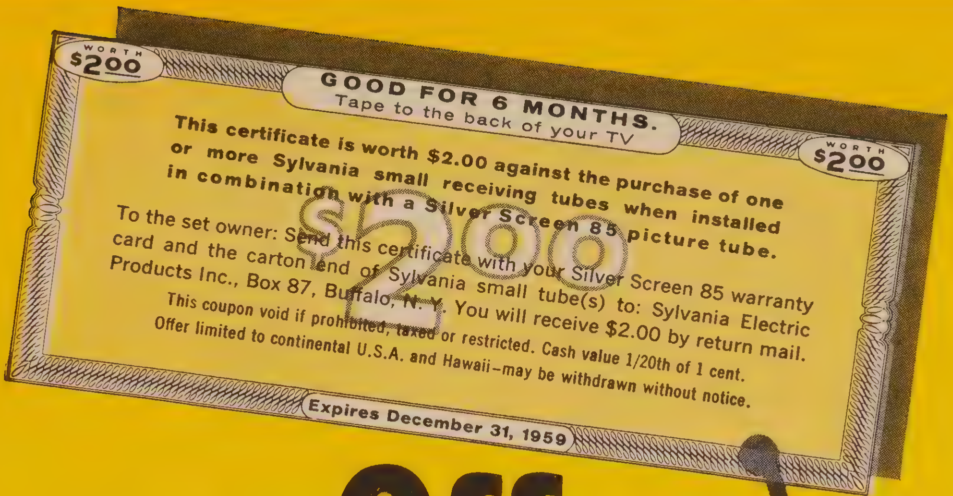
Look for this ad in these leading national magazines.

On June 20th Sylvania launched the dramatic combination coupon offer appearing in America's biggest weekly magazine, *TV Guide*, and America's biggest monthly magazine, *Reader's Digest*—plus *Sunday* and *Parade* newspaper supplement magazines.

Your Service shares the spotlight with top-quality Sylvania picture tubes and receiving tubes in a three-point program to make your customer's old TV set *better than when it was new.*

Month after month, more set owners will be saving the $2.00 coupon. Many will attach it to the back of their TV set so it's there for you to see.

You can identify yourself with this program by featuring Silver Screen 85 and Sylvania receiving tubes. Get behind the biggest, most practical, business-building offer ever made to the Service industry.



WORTH $2.00

GOOD FOR 6 MONTHS.
Tape to the back of your TV

WORTH $2.00

This certificate is worth $2.00 against the purchase of one or more Sylvania small receiving tubes when installed in combination with a Silver Screen 85 picture tube.

$2.00

To the set owner: Send this certificate with your Silver Screen 85 warranty card and the carton end of Sylvania small tube(s) to: Sylvania Electric Products Inc., Box 87, Buffalo, N.Y. You will receive $2.00 by return mail.

This coupon void if prohibited, taxed or restricted. Cash value 1/20th of 1 cent. Offer limited to continental U.S.A. and Hawaii—may be withdrawn without notice.

Expires December 31, 1959

Coupon Offer

Sells your service and Sylvania receiving tubes in combination with every Silver Screen 85 you install

Here's an action-packed offer that can add an average of $3.00 to $6.00 in receiving tube business every time you install a Silver Screen 85 picture tube.

Sylvania urges your customers to have their receiving tubes checked to make sure they get full performance from their new Silver Screen 85. And, to emphasize the importance of replacing weak tubes, Sylvania offers to pay $2.00 toward the cost of Sylvania receiving tubes installed in combination with a Silver Screen 85.

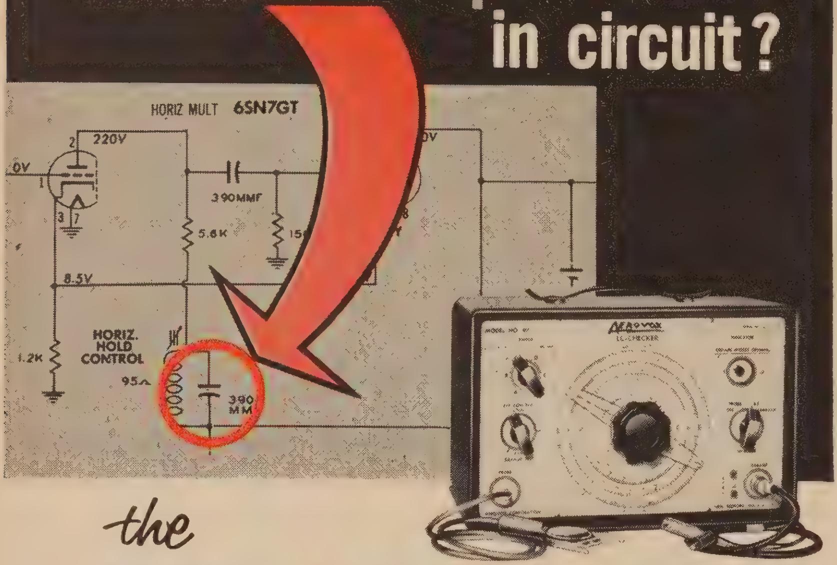
Your customers mail the $2.00 certificate directly to Sylvania with the picture-tube warranty card and receiving-tube carton end. Nothing for you to sign or send.

Stock up on Sylvania. Be prepared for greater-than-ever consumer demand for America's Number One picture tube and receiving tubes.

The Sylvania coupon taped to your customer's TV set means more receiving tube business and greater picture tube profits for you.

SYLVANIA
Subsidiary of
GENERAL TELEPHONE & ELECTRONICS
GENERAL SYSTEM

can your present
test equipment
check this capacitor
in circuit?


HORIZ MULT 6SN7GT
220V
0V
390MMF
5.6K
8.5V
HORIZ. HOLD CONTROL
1.2K
95Ω
390 MM
AEROVOX
LC-CHECKER

the

All New **Aerovox** Model 97

LC-CHECKER

will do this and much more!

Yes, the Aerovox LC-Checker will check the above and similar capacitors *regardless of the parallel circuitry and without disconnecting them from the circuit.* You can quickly and accurately locate defective units without performing the time consuming task of unsoldering and resoldering components. If your present test equipment cannot match this performance, then you *need* an Aerovox LC-Checker.

This versatile instrument also tests for capacitor leakage, determines resonant frequency of tuned circuits, checks inductance and performs many other service-important functions all for the low price of **$69.95.**

SEE IT...TRY IT...BUY IT TODAY...

...at your local Aerovox Parts Distributor. Write for free literature and address of your nearest distributor.

AEROVOX CORPORATION

DISTRIBUTOR DIVISION

NEW BEDFORD, MASSACHUSETTS

Module

(Continued from page 46)

may be located on either side or both sides. If an occasion arises whereby a replacement module is not available and it is imperative to effect an immediate repair, a good component, replacing the defective one, can be added to the riser connections or directly to the deck. Riser wires should not be cut with a wire cutter because the decks may be damaged when the riser wire is forced apart by the cutter edge; a fine-toothed saw blade is suggested.

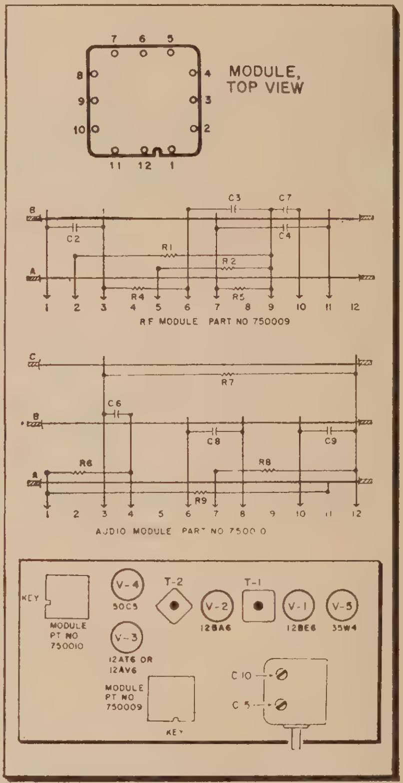

MODULE, TOP VIEW
1
2
3
4
5
6
7
8
9
10
11
12
C2
C3
C7
C4
R1
R2
R4
R5
A
B
C
RF MODULE PART NO 750009
R7
C6
C8
C9
R6
R8
R9
AUDIO MODULE PART NO 7500 0
KEY
MODULE PT NO 750010
V-4
50C5
T-2
V-2
12BA6
T-1
V-1
12BE6
V-5
35W4
V-3
12AT6 OR 12AV6
MODULE PT NO 750009
C 10
C 5

Fig. 11—Most of the resistors and capacitors in an Emerson radio Model 851B are contained in just two modules. The a-f module has three decks and the r-f two decks.

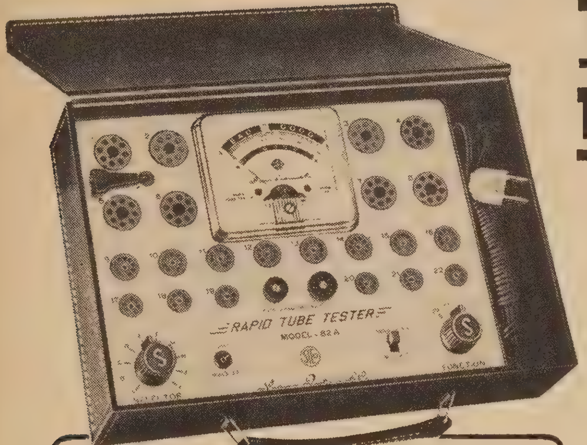
Modules may be replaced, when they are defective, by unsoldering all its connections to the printed board. Marking the position of the locating notch will assure that the replacement is installed with the correct alignment. ●

ILLUSTRATED CREDITS: Aerovox Corp., Module Div., New Bedford, Mass., Erie Resistor Corp., Erie, Pa.

SUPERIOR'S NEW MODEL 82A

Multi-Socket Type

TUBE TESTER



Model 82A — TUBE TESTER . . . Total Price $36.50 — Terms: $6.50 after 10 day trial, then $6.00 monthly for 5 months if satisfactory. Otherwise return, no explanation necessary.

TEST ANY TUBE IN 10 SECONDS FLAT!

① Turn the filament selector switch to position specified.

② Insert tube into a numbered socket as designated on our chart (over 600 types included).

③ Press down the quality button —

THAT'S ALL!

Read emission quality direct on "BAD-GOOD" meter scale.

Production of this Model was delayed a full year pending careful study by Superior's engineering staff of this new method of testing tubes. Don't let the low price mislead you! We claim Model 82A will outperform similar looking units which sell for much more — and as proof, we offer to ship it on our examine before you buy policy.

To test any tube, you simply insert it into a numbered socket as designated, turn the filament switch and press down the quality switch — THAT'S ALL! Read quality on meter. Inter-element leakage if any indicates automatically.

Specifications

- Tests over 600 tube types
- Tests 0Z4 and other gas-filled tubes
- Employs new 4" meter with sealed air-damping chamber resulting in accurate vibrationless readings
- Use of 22 sockets permits testing all popular tube types and prevents possible obsolescence
- Dual Scale meter permits testing of low current tubes
- 7 and 9 pin straighteners mounted on panel
- All sections of multi-element tubes tested simultaneously
- Ultra-sensitive leakage test circuit will indicate leakage up to 5 megohms

Model 82A comes housed in handsome, portable Saddle-Stitched Texon case. Only .... **$36 50 NET**

(Picture Tube Adapter available for $5.50 additional.)

SHIPPED ON APPROVAL

NO MONEY WITH ORDER — NO C.O.D.

Try it for 10 days before you buy. If completely satisfied **then** send $6.50 and pay balance at rate of $6.00 per month for 5 months. **No Interest or Finance Charges Added.** If not completely satisfied, return to us, no explanation necessary.

MOSS ELECTRONIC, INC.
Dept. D-673, 3849 Tenth Ave., New York 34, N. Y.

Please rush one Model 82A on approval. If completely satisfied I agree to pay $6.50 within 10 days after receipt and $6.00 per month thereafter. Otherwise I will return, positively cancelling all further obligation.

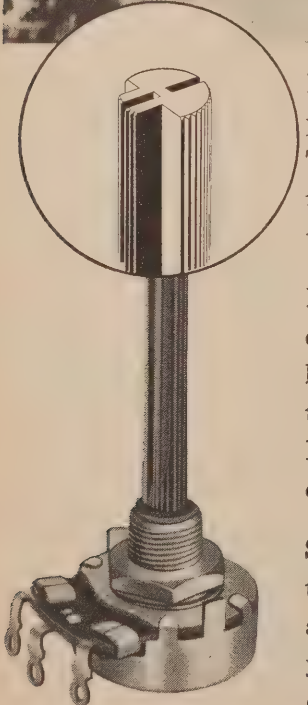
☐ Include Model 82A Picture Tube Adapter $5.50

NAME ....

ADDRESS ....

CITY .... **ZONE** .... **STATE** ....

All prices net, F.O.B., N.Y.C.



Hit any target

with

Centralab

Universal Shaft

Model B

Radiohm® Controls

If you're aiming for faster servicing and greater profits, ask for CENTRALAB Model B Controls. These are the only replacement carbon controls with a truly universal shaft that adapts to any application.

For any shaft target—split knurl, shallow flat, deep flat, half round, round, etc.—the Model B hits the bulls-eye. Its universal fluted, knurled-type shaft adapts to all knobs perfectly. AC Line switches snap right on, trigger-quick, to convert the control to a switch type unit.

Shoot right over to your CENTRALAB distributor and stock up on Model B Controls . . . and while you're there, be sure to Tell him you want your free copy of the brand-new CENTRALAB catalog.

Centralab

B-5957

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902 I E. KEEFE AVE. • MILWAUKEE 1, WIS.
IN CANADA: 669 Bayview Ave. • Toronto 17, Ont.

CONTROLS • ROTARY SWITCHES • CERAMIC CAPACITORS
PACKAGED ELECTRONIC CIRCUITS • ENGINEERED CERAMICS

(Continued from page 43)

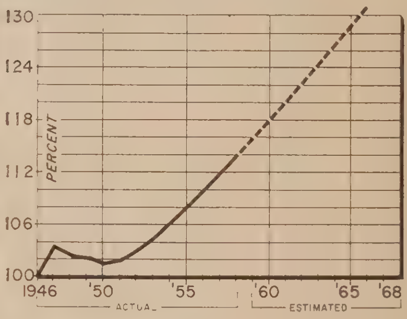
Total TV Picture Tubes Renewal Market

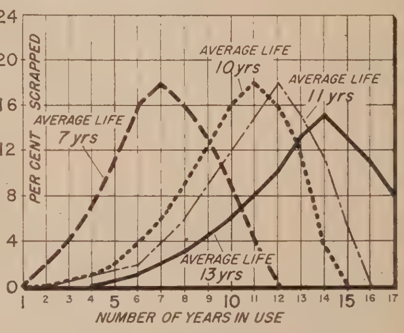
	Total TV Sets In Use B. O. Y.	Replacement Rate Per Set	Renewal Tube Sales
	(000,000)		(000,000)
1940	—	— %	—
1950	3.7	16.0	.6
1952	15.6	12.1	1.9
1954	26.9	14.1	3.8
1956 E	37.4	14.7	5.5
1957 E	42.8	14.0	6.0
1958 E	46.7	13.3	6.2
1959 J	50.2	13.6	6.8
1960 J	53.7	13.8	7.4
1963 J	63.3	13.7	8.6
1966 J	72.0	13.5	9.7
1968 J	78.0	13.3	10.3

E-Estimate J-Projection

Ratio: TV Sets To TV Homes

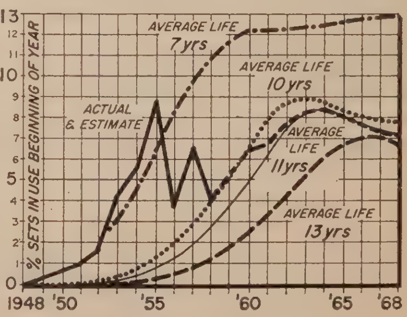
Based on total sets in homes plus those in commercial establishments. End 1958 sets in homes/TV homes = 110.5%, total sets/TV homes = 113.9%.



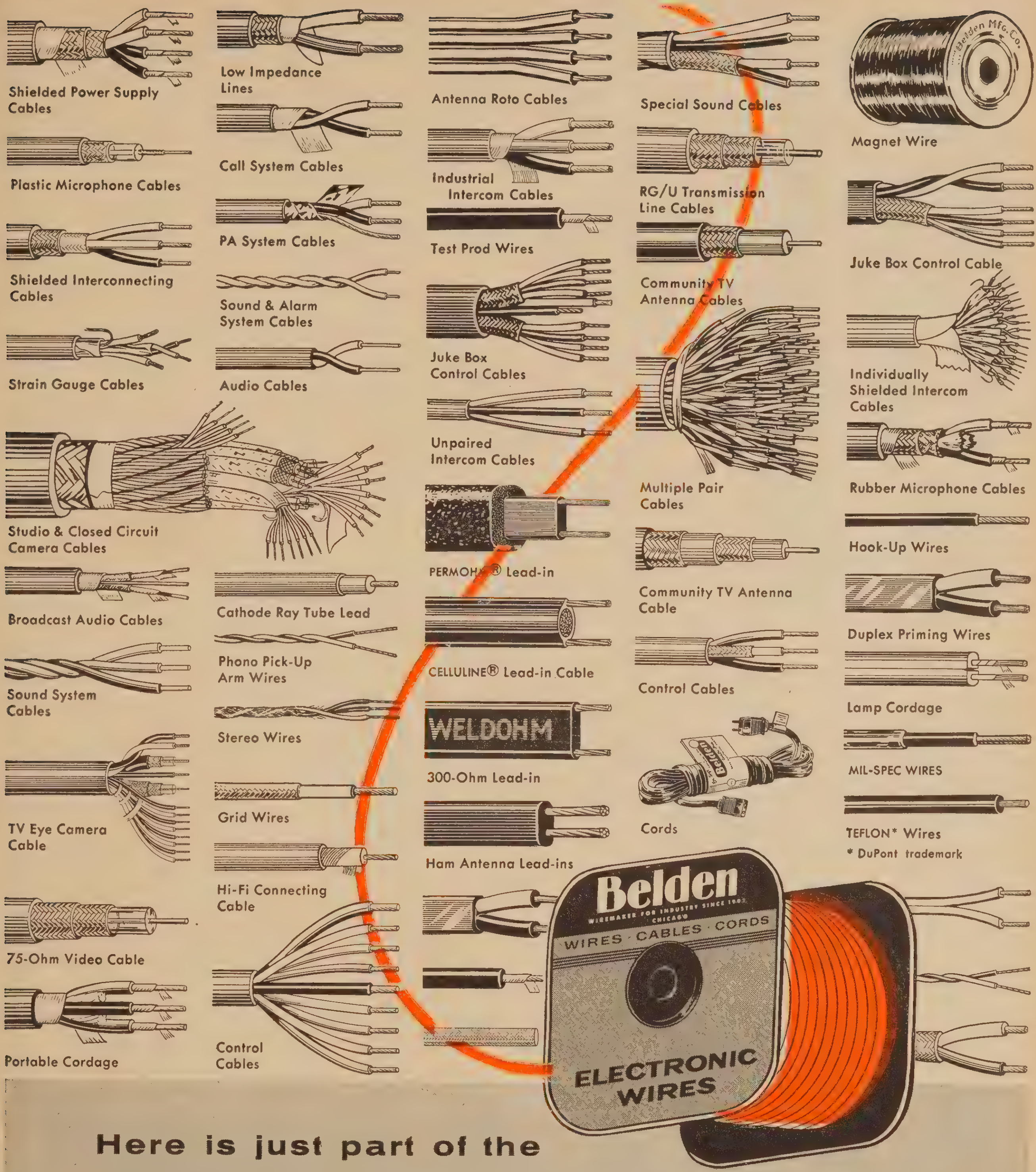


TV Sets—Scrapping Curve Theoretical Wearout Rate

TV Set Replacement Rate



(Continued on page 62)


Shielded Power Supply Cables
Plastic Microphone Cables
Shielded Interconnecting Cables
Strain Gauge Cables
Studio & Closed Circuit Camera Cables
Broadcast Audio Cables
Sound System Cables
TV Eye Camera Cable
75-Ohm Video Cable
Portable Cordage
Low Impedance Lines
Call System Cables
PA System Cables
Sound & Alarm System Cables
Audio Cables
Cathode Ray Tube Lead
Phono Pick-Up Arm Wires
Stereo Wires
Grid Wires
Hi-Fi Connecting Cable
Control Cables
Antenna Roto Cables
Industrial Intercom Cables
Test Prod Wires
Juke Box Control Cables
Unpaired Intercom Cables
PERMOHM® Lead-in
CELLULINE® Lead-in Cable
WELDOHM
300-Ohm Lead-in
Ham Antenna Lead-ins
Special Sound Cables
RG/U Transmission Line Cables
Community TV Antenna Cables
Multiple Pair Cables
Community TV Antenna Cable
Control Cables
Belden
Cords
Belden Mfg. Co.
Magnet Wire
Juke Box Control Cable
Individually Shielded Intercom Cables
Rubber Microphone Cables
Hook-Up Wires
Duplex Priming Wires
Lamp Cordage
MIL-SPEC WIRES
TEFLON* Wires
* DuPont trademark
Belden
WIREMAKER FOR INDUSTRY SINCE 1902
CHICAGO
WIRES · CABLES · CORDS
ELECTRONIC WIRES

Here is just part of the

WORLD'S MOST COMPLETE LINE

of Electronic Wire and Cable!

Belden
WIREMAKER FOR INDUSTRY
SINCE 1902
CHICAGO

Available from Stock

One Wire Source for Everything Electronic and Electrical

magnet wire • lead wire • power supply cords • cord sets • portable cordage • electronic wire • automotive replacement wire and cable • aircraft wire • electrical household replacement cords

8-3-9

VALVO
VALVO
VALVO
VALVO
VALVO

An exclusive service by
Amperex®
distributors:

VALVO
RECEIVING TUBES
for replacement in European radios

Many European radios and hi-fi components now popular in this country utilize the European-made **VALVO** tubes, which have thus far had no American distribution. As a special service to the trade, **VALVO** tubes are now being stocked by all franchised Amperex distributors. Replacement of the original tubes with completely identical types will assure optimum results in the repair and servicing of these European sets.

ask ***Amperex***
for the name and address of your nearest distributor

Amperex Electronic Corp.
230 Duffy Avenue Hicksville, L.I., N.Y.

Statistical Analysis

(Continued from page 60)

Receiving Tubes

Renewal Tube Sales — (000,000)

	Home Sets	Auto Sets	Total TV Sets	Phonographs	Total For Sets	Indus. & Comm.	Total
1950	40.2	10.9	13.5	1.6	66.2	3.5	69.7
1952	39.9	12.9	39.8	1.9	94.5	6.5	101.0
1954	36.0	12.1	73.1	2.2	123.4	10.4	133.8
1956	31.9	10.7	110.5	2.5	155.6	14.1	169.7
1957	32.8	11.4	121.3	2.6	168.1	16.4	184.5
1958	33.7	11.9	121.4	2.9	169.9	18.7	188.6
1959 J	33.4	12.2	130.3	3.1	179.0	20.1	199.1
1960 J	35.2	12.7	138.6	3.4	189.9	20.6	210.5
1963 J	37.6	14.2	163.0	4.0	218.8	20.4	239.2
1966 J	40.1	15.9	186.9	4.5	247.4	19.4	266.8
1968 J	41.9	17.1	203.8	4.8	267.6	18.2	285.5

J - Projection

Television Sets — By Vintage

Number in Use and Number Scrapped

	Sets Sold To Public (000)	# Sets Scrapped As of 1-1-59 (000)	Sets In Use 1-1-59 (000)	% of Total In Use 1-1-59	% Sets Sold Still Remaining In Use (1-1-59)
1948*	1,015	985	30	— %	3.0%
1949	2,668	2,152	516	1.0	19.3
1950	6,132	3,836	2,296	4.6	37.4
1951	5,905	2,669	3,236	6.5	54.8
1952	6,145	1,752	4,393	8.8	71.5
1953	6,371	223	6,148	12.3	96.5
1954	7,327	110	7,217	14.4	98.5
1955	7,476	37	7,439	14.8	99.5
1956	6,890	—	6,890	13.7	100.0
1957	6,685	—	6,685	13.3	100.0
1958	5,300	—	5,300	10.6	100.0
1958K	61,914	11,764	50,150	100.0%	—

* - Through 1948
K - Cum'l. through 1958

Electronics Industry — Sales

Home & Non-Home Devices — Broadcasting Revenue and Grand Total

(000,000)

	Sets, Repairs and Service	Indus. & Comm. Total	Defense Electronics	Radio & TV Broadcasting Revenue	Grand Total Electronics Industry
1950	$3,110	$ 677	$ 560	$ 550	$ 4,897
1952	3,342	990	2,190	794	7,316
1954	3,733	1,125	2,671	1,042	8,572
1956	4,482	1,650	3,359	1,378	10,869
1957	5,212	2,163	4,234	1,385	12,994
1958	4,776	2,272	4,336	1,545	12,929
1959 J	5,267	2,466	4,775	1,640	14,148
1960 J	5,573	2,814	5,200	1,740	15,327
1963 J	6,515	3,782	6,500	2,145	18,942
1966 J	7,194	4,980	8,580	2,470	23,224
1968 J	7,502	5,878	10,200	2,705	26,285

J - Projection

(Continued on page 73)

New Books

Book marked with an asterisk (*) may be obtained prepaid from Electronic Marketers, Book Sales Division of Electronic Technician

***TRANSISTORS IN RADIO, TV AND ELECTRONICS.** *By Milton S. Kiver. Published by McGraw-Hill Book Co. 424 pages, hard cover. $7.95.*

Originally printed in 1956, this second edition has been completely revised to keep up with the significant advances made in transistor design and applications. The clearly written text includes transistor radio receivers, transistors in TV receivers and servicing transistor circuits. The book also offers a complete discussion of transistor theory, use in electronic circuits and design. Generously illustrated with pictures and diagrams, it will serve the electronic technician admirably as an instructive guide to present-day transistor operation.

SYMPOSIUM ON MICROMINIATURIZATION OF ELECTRONIC ASSEMBLIES. *Edited by Eleanor F. Horsey and Laurence D. Shergalis. Published by Hayden Book Co. Inc., 830 Third Ave., New York 22, N. Y. 278 pages, hard cover. $11.00.*

The informational material contained in this book covers the current developments and techniques in miniaturized components and their application to electronic equipment. Most of the material is based on industry papers presented at a 1958 discussion meeting and its sections include: techniques; semiconductors; components; and circuits. Ample illustrations accompany the text. The volume is basically for readers interested in microminiaturization manufacturing methods and design applications.

TECHNIQUES OF PLANT MAINTENANCE & ENGINEERING, *Volume X. Published by Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N. Y. 266 pages, hard cover. $10.00.*

The tenth annual report of the National Plant Maintenance and Engineering Conference is a constructive round-up of the latest advances and thinking of management in this field. A broad subject range is presented from prepared papers, informal discussions and contributions at this forum. Subjects include Arc Welding, Maintenance, Maintaining Automatic Control Equipment, Labor Relations and Management. Informative discussions follow every paper presented. In addition, complete roundtable discussions are reported, covering such topics as Nuclear Plants, Electrical Manufacturing Plants and Chemical Plants. The technician planning to enter the inviting industrial maintenance field will appreciate the opportunity to be aware of the scope of problems faced by industry managers and how they attempt to cope with them.

(Continued on page 72)

HOW TO USE TEST PROBES *by A. A. Ghirardi & R. G. Middleton.* Written by two of the country's leading electronics experts, this book covers all types of test probes used with VOM'S, VTVM'S, and scopes. The one book that tells you what probe to use, where to use it, how to use it! The book will save you money, time and trouble. It will prevent making mistakes and wrong conclusions. Complete, step-by-step explanations, with practical examples throughout. #165, $2.90.

BASIC AUDIO *by Norman H. Crowhurst.* The Rider "picture-book" approach has made many technical subjects understandable to many hundreds of thousands of people. Now, everything about sound and audio reproduction is made crystal-clear. If hi-fi is your interest — or if you work with tape recorders—or the broad subject of sound reproduction interests you,—or if you assemble your hi-fi equipment or buy a complete "package"—you must read BASIC AUDIO.

If you already own sound reproducing equipment—this "picture-book" course will give you an all-around background on all the important details of sound reproduction. It will enable you to get most from your equipment.

You can learn easily, rapidly at very low cost. You build your knowledge step-by-step. There's one idea and one specially prepared illustration per page. More than 400 illustrations for maximum understanding.
#201, 3 vols., soft covers, $8.70 per set.

REPAIRING TELEVISION RECEIVERS, *by Cyrus Glickstein.* The most modern completely practical book, written by an expert with long experience in television receiver repair. Devoted to trouble-shooting and repair techniques which are modern, yet down-to-earth. Covers the use of simple as well as elaborate test equipment #191, Only **$4.40.**

3rd SUPPLEMENT to the RECEIVING TUBE SUBSTITUTION GUIDEBOOK, *by H. A. Middleton.* A must for every technician! Contains more than 830 latest receiving tube substitutions • more than 200 picture tube substitutions • more than 230 American to European tube substitutions • more than 200 European to American tube substitutions • a cumulative index listing the tube types treated in the basic book and all 3 supplements. It pays for itself almost immediately! #139-3—Soft Cover, 72 pp., 8½" x 11", illus. Only **$1.35.**

RECEIVING TUBE SUBSTITUTION GUIDEBOOK, *by H. A. Middleton.* #135—Soft cover, 224 pp., 8½" x 11", illus., **$3.00.**

FIRST SUPPLEMENT, #139—Soft cover, 48 pp., 8½" x 11", illus., **$.99.**

SECOND SUPPLEMENT, #139-2—Soft cover, 48 pp., 8½" x 11", illus., **$.99.**

HOW TO INSTALL AND SERVICE AUTO RADIOS (2nd edition) *by Jack Darr.* The 2nd edition of this extremely informative and practical book brings auto radio installation and servicing right up to date. All the new tricks of the trade are to be found here. The techniques applicable to the most modern auto radios—signal-seeking tuners, hybrid auto radios, transistor auto radios, conversion from 6 to 12 volt operation, and many more new things are explained in great detail. The author, an expert in this field runs a very successful auto radio and mobile radio installation and service shop. This 2nd edition contains practical, proven solutions and is really a money making "tool" #159, $3.25.

HOME AIR CONDITIONING — *Installation & Repair by J. Derman, F. Makstein, H. Seaman.* This modern, completely practical text by three experts in the field of home air conditioning, enables anyone to understand the organization, operation, installation and repair of all types of home air conditioners. Starting with the principles of the process of cooling air, it covers all facets of home air conditioners.

Tells how to select the proper unit to meet the requirements set by windows, walls, floors, ceilings, the cubic dimensions of the space to be served and the number of people for which the unit will be used. #211. **$3.50.**

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Recommended wherever increased reliability of small-tube circuitry is important. Characteristics are uniform throughout useful life. Rigid controls and rigorous tests weed out "early failures". Designed and built to give dependable performance under conditions of shock and vibration. Available at RCA Industrial Tube Distributors.

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Handy data book RIT-104-A includes the tube characteristics you need to know when you install RCA "Premium" and "Special Red" Tubes. Free, from your RCA Industrial Tube Distributor.

For the name of your nearest RCA Industrial Tube Distributor, call Western Union by telephone and ask for Operator 25.

Unloading The Flyback

(Continued from page 39)

cuit. In a similar manner, the width control and any other circuits not directly responsible for the development of high voltage can be disconnected.

Even the damper circuit can, in many instances, be disabled to unload the flyback. The resulting absence of boost voltage will in most sets depreciate the amount of high voltage generated, but there will still be enough high voltage developed if the balance of the circuitry is in good order. However, it is important that B+ to the plate of the horizontal output tube be maintained when the damper circuit is opened. A simple gimmick, shown in Fig. 4, is to temporarily connect B+ directly to the flyback at the point where the damper was disconnected.

Vertical Circuit Robs High Voltage

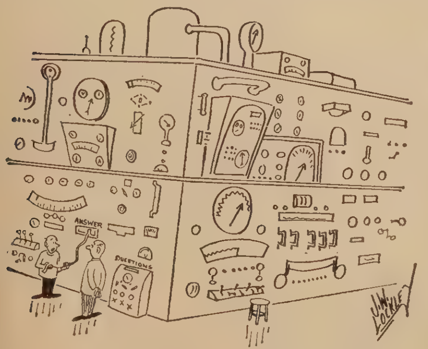
It is not unusual to find a loss of high voltage due to a defect in the vertical circuit. Where the horizontal and vertical windings in the yoke are connected together, a short or other circuit upset, particularly in the vertical output section, can cause a loss of high voltage. A shorted vertical output transformer has caused more than one servicing technician to scratch his greying head. These transformers are usually of the high efficiency, auto-transformer type, and like other transformers, they develop shorted turns or shorts to the core. In both cases the transformer will run hotter than normal, and a touch of the hand may be the tipoff. Another check is to temporarily lift and insulate the vertical output transformer from the chassis. If all that was wrong was a short to the core, the high voltage will be restored when the set is turned on once again. The usual remedy in this situation is to replace the shorted transformer.

Low Frequency Oscillator

Modern TV receivers employing afc circuits to control the frequency of the horizontal oscillator sometimes go astray, and cause the oscillator to stop or slow down considerably. A dead oscillator can be readily detected, but a very slow operating one can be quite deceptive. Its output waveform and amplitude could be quite close to normal, but the ability of the flyback to operate is adversely affected. Unfortunately an a-c voltmeter cannot reveal either the waveshape or its frequency.

This is an opportune moment for the scope to do its bit. If difficulty is encountered when setting up the scope to indicate frequency, simply connect the scope to the horizontal oscillator output of a set whose picture is properly synced, and adjust the scope for two complete line waveforms. This places the scope at 7,875 cps. Now transfer the scope back to the oscillator in the set under repair. If less than two waveforms appear, or if the waveform seems incomplete, the oscillator is running too slow. More than two waveforms indicate a faster-than-normal oscillator, but it usually will not adversely affect the flyback's ability to produce high voltage. If the afc circuit is at fault, disabling it, or grounding the grid of the horizontal oscillator will in most cases restore almost normal operation. Although the horizontal oscillator will drift under these circumstances, the horizontal hold control will help stabilize the picture long enough to evaluate the situation.

A logical troubleshooting technique in the high voltage section is often neglected by many experienced technicians. Substitution of a flyback is frequently made before the set is accurately analyzed. Avoid unnecessary replacements by first checking out the appropriate circuits. It's double work to replace the original flyback in the event that the new one doesn't do the trick . . . and frustrating too. •



"It says it refuses to answer on the grounds that it may tend to incriminate."

For Checking Miniaturized Equipment, Pyramid's Model RC-1 New Resistance-Capacity-Ratio Bridge Tester. Budget priced . . . outstanding quality instrument . . . the RC-1 saves you both time and money. Precision-engineered, Pyramid's new model RC-1, Resistance-Capacity-Ratio Bridge Tester has a special low voltage bridge and stable vacuum tube amplifier for safe testing low voltage electrolytics such as commonly used in transistorized receivers.

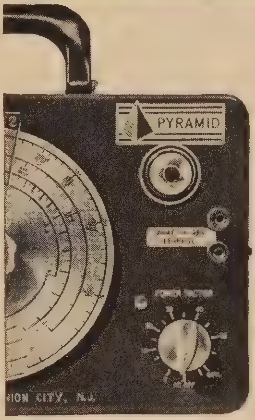
Pyramid's RC-1, Resistance-Capacity-Ratio Bridge Tester is a functionally designed, sturdy, compact, lightweight unit, ideal for use by technicians, servicemen and engineers in radio, television (color as well as black and white), industrial electronics and all related fields.

PYRAMID MODEL RC-1 FEATURES:

- Special 3 volt amplifier for checking low voltage electrolytics used in miniaturized equipment such as transistor radios, etc.
- Capacity Ranges—from 10 mmfd. to 2000 mfd.
- Resistance—from .5 ohms to 200 megohms in 4 ranges.
- Ratio Test—provides quick reactance or resistance ratio between any two capacitors, inductors or resistors —range: .05 to 1 and 20 to 1. It can be used also to determine turns ratio of transformer windings within this range.
- Leakage Tests—handles all types of capacitors at rated voltages between 0 and 500V DC.
- Power Factor—0 to 60% (on capacitors from .1 mfd to 2000 mfd).
- Capacitor Test Voltages—variable between 0 and 500V DC in 17 steps.

PRICE: Dealer Net—$44.95

For further information about the RC-1 see your Pyramid distributor or write for complete technical data to: Pyramid Electric Company, Union City, N. J. EXPORT: 458 Broadway, N. Y. 13, N. Y. • CANADA: Wm. Cohen, Ltd.—7000 Park Ave., Montreal.



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MODEL RC-1
CAPACITANCE-RESISTANCE-RATIO BRIDGE
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NEW

CRT TESTER-REACTIVATOR Model CRT-2

Housed in hand-rubbed oak carrying case — complete with MULTI-HEAD*

Model CRT-2
$57 50
Net

TERMS: $13.50 within 10 days. Balance $11 monthly for 4 months.

The CRT-2 steps in and solves the limitations and shortcomings of present day CRT Testers. Unlike ordinary CRT testers that keep entering the field with a limited range of operation, the CRT-2 employs a new brilliantly engineered circuit designed to test, repair and reactivate every black and white or color picture tube made. The CRT-2 eliminates the guesswork and risk that until now, has always been present when a picture tube is reactivated. It accomplishes this by providing perfect control of either the 'Boost' or 'Shot' method of reactivation.

THE CRT-2 DOES ALL THIS RIGHT IN THE CARTON, OUT OF THE CARTON OR IN THE SET

TEST

- ✓ for quality of every black and white and color picture tube
- ✓ for all inter-element shorts and leakage up to one megohm
- ✓ for life expectancy

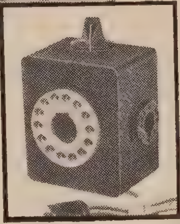
REPAIR

- ✓ Will clear inter-element shorts and leakage
- ✓ Will weld opens between any two elements in the tube gun

REACTIVATE

- ✓ The unique controlled 'SHOT' (high voltage pulse) method of reactivation provided by the CRT-2 will restore picture tubes to new life in instances where it was not possible before. Furthermore the high voltage is applied without danger of stripping the cathode as you always have perfect control of the high voltage pulse.
- ✓ The 'BOOST' method of reactivation also provided by the CRT-2 is used effectively on tubes with a superficially good picture but with poor emission and short life expectancy. It will improve definition, contrast and focus greatly and add longer life to the picture tube.

NOW . . . a TESTER-REACTIVATOR really designed to test, repair and reactivate EVERY PICTURE TUBE MADE — whether black and white or color . . . with exclusive features never before found in picture tube testers.



1. **THE MULTI-HEAD** (patent pending) . . . **A SINGLE PLUG IN CABL AND UNIQUE TEST HEAD** — A tremendous advance over the maize o cable and adapters generally found with other testers. Enables you to test repair and reactivate every type of picture tube with greater convenience thar ever before . . . 50 degree to 110 degree types from 8" to 30", whether 12 pi base, 8 pin base, 14 pin base . . . even the very latest 7 pin base. A specia color switch on the MULTI-HEAD enables you to test, repair and reactivat each of the red, green and blue color guns separately.

2. **WATCH IT REACTIVATE THE PICTURE TUBE** — You actually see and con trol the reactivation directly on the meter as it takes place, allowing you fo the first time to properly control the reactivation voltage. This eliminates th danger of stripping the cathode of the oxide coating. It enables you to see th speed of reactivation and whether the build-up is lasting. You will see if th cathode contamination is too great and if the picture tube is too far gone t be reactivated.

3. **CONTROLLED "SHOT" WITH HIGHER VOLTAGE FOR BETTE REACTIVATION** — Stronger than any found in other testers . . . high enoug to really do the job — yet controlled to avoid damage to the picture tube

4. **UNIQUE HIGH VOLTAGE PULSE CIRCUIT** — Will burn out inter-elemer shorts and weld open circuits with complete safety to the picture tube.

5. **VISUAL LIFE TEST** — Enables both you and your customer to see the lif expectancy of any picture tube right on the meter. The fact that your cu tomer can see the results of your tests as you make them virtually eliminate resistance to picture tube replacement when necessary.

6. **TESTS, REPAIRS AND REACTIVATES SPECIAL LOW SCREEN VOLTAG TUBES** — Many new type picture tubes use special low voltage of approx mately 50 volts. The CRT-2 will test, repair and reactivate these types wi the same thoroughness as the regular types with complete safety.

7. **SEPARATE FILAMENT VOLTAGES** — Including the very latest 2.35 vo and 8.4 volt types as well as the older 6.3 volt types.

8. **TESTS, REPAIRS AND REACTIVATES 'SF' PICTURE TUBES** — found the newest Sylvania and Philco TV sets. These picture tubes have differe base pin connections than standard picture tubes and there is always element of risk that the tube may be burned out when tested with ordina picture tube testers. The CRT-2 is designed to accommodate this new ba pin arrangement and will test the tube with no danger of damage.

ADDITIONAL FEATURES

• Employs the time proven dynamic cathode emission test principle • Large 4 meter with heavily damped movement for smooth action, accuracy and long l • Provides separate shorts test for each element in the picture tube • Filame continuity is shown on a separate glow indicator • An easy to read instructi manual contains all the latest testing information on old and new type pictu tubes • Housed in handsome hand-rubbed oak carrying case with special compa ment for MULTI-HEAD and line cord.

* patent pending

IN-CIRCUIT CONDENSER TESTER Model CT-1

Here is an **IN-CIRCUIT CONDENSER** that **DOES THE WHOLE JOB!** The CT-1 actually steps in and takes over where all other in-circuit condenser fail. The ingenious application of a dual bridge principle gives the CT-1 a tremendous range of operation . . . and makes it an absolute 'must' for every serviceman.

in-circuit checks:

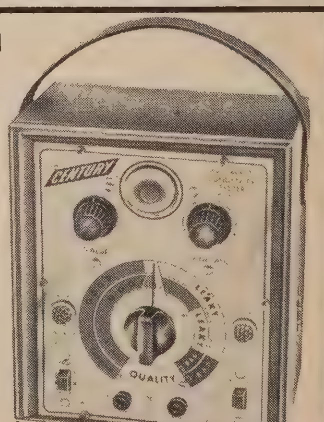
- ✓ Quality of over 80% of all condensers even with circuit shunt resistance . . . (This includes leakage, shorts, opens, intermittents)
- ✓ Value of all condensers from 200 mmfd. to .5 mfd.
- ✓ Quality of all electrolytic condensers (the ability to hold a charge)
- ✓ Transformer, socket and wiring leakage capacity

out-of-circuit checks:

- ✓ Quality of 100% of all condensers . . . (This includes leakage, shorts, opens and intermittents)
- ✓ Value of all condensers from 50 mmfd. to .5 mfd.
- ✓ Quality of all electrolytic condensers (the ability to hold a charge)
- ✓ High resistance leakage up to 300 megohms
- ✓ New or unknown condensers . . . transformer, socket, component and wiring leakage capacity

OUTSTANDING FEATURES

- ● Ultra-sensitive 2 tube drift-free circuitry
- ● Multi-color direct scale readings for both quality and value . . . in-circuit or out-of-circuit
- ● Simultaneous readings of circuit capacity and circuit resistance
- ● Built-in hi-leakage indicator sensitive to over 300 megohms
- ● Cannot damage circuit components
- ● Electronic eye balance indicator for every greater accuracy
- ● Isolated power line
- ● Housed in sturdy hammertone finish steel case . . . comes complete with test leads



Model CT-1
$34 50
Net

TERMS: $9.50 within 10 days. Balance $5 monthly for 5 months.

EASY TO BUY IF SATISFIED – *see order form on facing page*

OR 10 DAY *FREE* TRIAL

Convince yourself at no risk that CENTURY instruments are indispensable in your every day work. Send for instruments of your choice without obligation . . . try them for 10 days before your buy . . . only then, when satisfied, pay in easy-to-buy monthly installments — without any financing or carrying charges added.

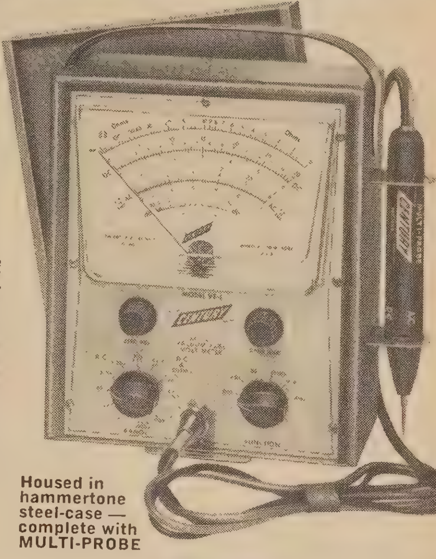
NEW Battery Operated Peak-to-Peak VACUUM TUBE VOLT METER Model VT-1

WITH LARGE EASY-TO-READ 6" METER —

eaturing the sensational new *MULTI-PROBE* * Patent Pending

No extra probes to buy! The versatile MULTI-PROBE does the work of 4 probes

) DC Probe ② AC-Ohms Probe ③ Lo-Cap Probe ④ RF Probe



Housed in
hammertone
steel-case —
complete with
MULTI-PROBE

The VT-1 is a tremendous achievement in test equipment. With its unique MULTI-PROBE it will do all the jobs a V.T.V.M. should do without the expense of buying additional probes. No longer do you have to cart around a maize of entangled cables, lose time alternating cables or hunting for a misplaced probe. With just a twist of the MULTI-PROBE tip you can set it to do any one of many time-saving jobs. A special holder on side of case keeps MULTI-PROBE firmly in place ready for use.

FUNCTIONS

DC VOLTMETER . . . Will measure D.C. down to .5 volts full scale with minimum circuit loading, nd give accurate readings of scale divisions as low s .025 volts . . . Will measure low AGC and oscillator ias voltages from .1 volts or less up to 1500 volts vith consistent laboratory accuracy on all ranges . . . ero center provided for all balancing measurements uch as discriminator, ratio detector alignment and i-fi amplifier balancing.

AC VOLTMETER . . . True Peak-to-Peak measurenents as low as 3 volts of any wave form including V sync, deflection voltages, video pulses, distortion n hi-fi amplifiers, AGC and color TV gating pulses . . . cale divisions are easily read down to .1 volts . . . leasures RMS at 1/20th the circuit loading of a .O.M. . . . Unlike most other V.T.V.M.'s there is no oss in accuracy on the lowest AC range.

LECTRONIC OHMETER . . . Measures from 0 1000 megohms . . . Scale divisions are easily read own to .2 ohms . . . Will measure resistance values om .2 ohms to one billion ohms . . . Will detect igh resistance leakage in electrolytic and by-pass ondensers.

F and LO-CAP MEASUREMENTS . . . ith these extra VT-1 functions you can measure ltages in extremely high-impedance circuits such sync and AGC pulses, driving saw tooth voltages, lor TV gating pulses, mixer output levels, I.F. age-by-stage gain and detector inputs.

OUTSTANDING FEATURES

• Completely portable — self powered with long life batteries — permits use everywhere • New advanced pentode amplifier circuit assures amazingly low battery drain • Large 6" 100-microampere meter, many times more sensitive than meters used in most V.T.V.M.'s • Laboratory accuracy performance — 2% of full scale on DC, 5% of full scale on AC • Simplified multi-color easy-to-read 4-scale meter • No heat operation assures rigid stability and accuracy • Immune to power line fluctuations • Amplifier rectifier circuit with frequency compensated attenator — a feature found only in costly laboratory instruments • Meter completely isolated — practically burn-out proof • Hand-crafted circuitry eliminates the service headaches of printed circuitry • 1% resistors used for permanent accuracy • Separate RF ground return for low-loss RF measurement • Microphone type co-axial connector • Matching cover protects instrument face — snaps on and off instantly.

SPECIFICATIONS

- **DC Volts** — 0 to 1.5/6/30/150/300/600/1500 volts
- **AC Volts (RMS and Peak-to-Peak)** — 0 to 3/12/60/300/1200 volts
- **Ohms** — 0 to a billion ohms, 10 ohms center scale — Rx1/10/100/1K/10K/100K/1M
- **RF** — Peak reading demodulator supplied for use on all DC ranges
- **Zero Center** — available on all DC volt ranges with zero at mid-scale
- **Decibels** — from —10 Db to +10/22/36/50/62 based on the Dbm unit: ODb-IMW in 600 ohms
- **Impedance** — 11 megohms DC, 1 megohm AC, 10 megohms Lo-Cap
- **Input Capacity** — 130 mmfd. RMS, 250 mmfd. Peak-to-Peak, 25 mmfd. Lo-Cap

Model VT-1
$58.50 Net

TERMS: $14.50 within 10 days. Balance $11 monthly for 4 months.

FAST-CHECK TUBE TESTER Model FC-2

Simply set two controls . . . insert tube . . . and press quality button to test any of over 700 tube types completely, accurately . . . IN JUST SECONDS!

GOOD
FAST CHECK TUBE TESTER

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Over 20,000 servicemen are now using the FAST-CHECK in their every day work and are cutting servicing time way down, eliminating unprofitable call-backs and increasing their dollar earnings by selling more tubes with very little effort. See for yourself at no risk why so many servicemen chose the FAST-CHECK above all other tube testers.

PICTURE TUBE TEST ADAPTER INCLUDED WITH FAST-CHECK

Enables you to check all picture tubes (including the new short-neck 110 degree type) for cathode emission, shorts and life expectancy . . . also to rejuvenate weak picture tubes.

RANGE OF OPERATION

- ✓ Checks quality of over 700 tubes types, employing the time proven dynamic cathode emission test. This covers more than 99% of all tubes in use today, including the newest series-string TV tubes, auto 12 plate-volt tubes. OZ4s, magic eye tubes, gas regulators, special purpose hi-fi tubes and even foreign tubes.
- ✓ Checks for inter-element shorts and leakage.
- ✓ Checks for gas content.
- ✓ Checks for life-expectancy.

SPECIFICATIONS

• No time consuming multiple switching . . . only two settings are required instead of banks of switches on conventional testers • No annoying roll chart checking . . . tube chart listing over 700 tube types is located inside cover. New listings are added without costly roll chart replacement • Checks each section of multi-section tubes and if only one section is defective the tube will read "Bad" on the meter scale • 41 phosphor bronze beryllium tube sockets never need replacement • 7-pin and 9-pin straighteners mounted on panel • Large 4½" D'Arsonval type meter is the most sensitive available, yet rugged — fully protected against accidental burn-out • Special scale on meter for low current tubes • Compensation for line voltage variation • 12 filament positions • Separate gas and short jewel indicators • Line isolated — no shock hazards • Long lasting etched aluminum panel.

NOTE: The Fast-Check positively cannot become obsolete . . . circuitry is engineered to accommodate all future tube types as they come out. New tube listings are furnished periodically at no cost.

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$69.50 Net

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STRUMENTS ARE
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- ☐ Model CRT-2 CRT TESTER REACTIVATOR $57.50
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- ☐ Model FC-2 Fast-Check Tube Tester $69.50
  $14.50 within 10 days. Balance $11 monthly for 5 months.

Prices Net F.O.B. Mineola, N. Y.

111 Roosevelt Avenue, Dept. 509 Mineola, New York

Please rush the instruments checked for a 10 day free trial. If satisfied I agree to pay the down payment within 10 days and the monthly installments as shown. If not completely satisfied I will return the instruments within 10 days and there is no further obligation. It is understood there will be NO INTEREST or FINANCING charges added.

Name ....
Please print clearly

Address ....

City .... State ....

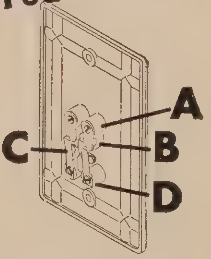
NEW *
TV/FM with "Anti-Stub" Switch
ANTENNA OUTLETS

New Type FD-1PK MOSLEY TV & FM Outlet permits multiple antenna outlets to be wired in *tandem* without losses due to stub effect of unused line.

*When polarized plug is inserted, the silver-plated spring leaf switch opens the circuit beyond the outlet in use. Action is positive . . . fail-safe!

Type FD-1PK, complete with polarized plug and mounting brackets. List Price $2.20

Exclusive Features!



A. Strong one-piece molded construction!
B. Passive contacts lock in place!
C. Contacts are silver-plated . . . positive, corrosion proof!
D. Molded guide holds contacts parallel . . . prevents shorts!

Available at your favorite parts distributor.

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New Products

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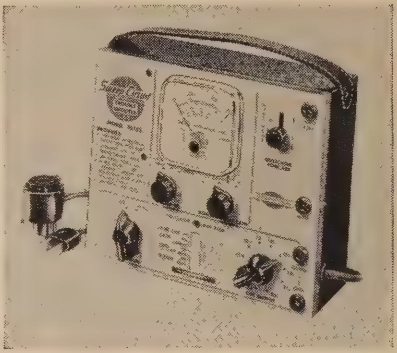
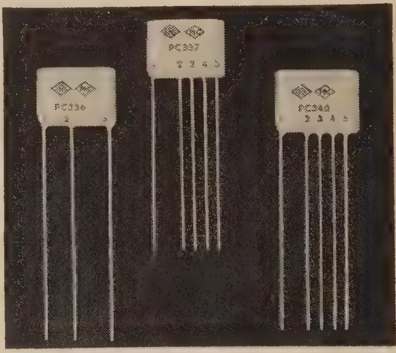
Sencore TEST UNIT



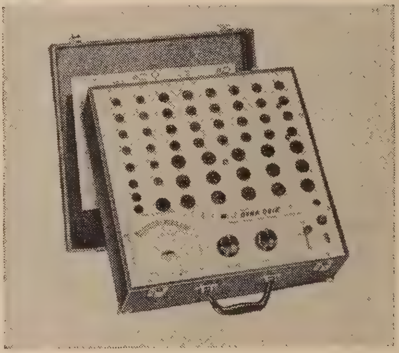
The SS105 sweep circuit troubleshooter is designed to pinpoint, in seconds, horizontal and vertical sweep troubles in TV receivers. It serves as a universal horizontal oscillator, horizontal output cathode current checker, universal deflection yoke, dynamic flyback transformer checker, voltmeter, and universal vertical oscillator. Dimensions: 7"x6"x3½". Weight: 4 lbs. $39.50. Sencore, Addison, Ill. (ELECTRONIC TECHNICIAN 9-16)

Centralab CIRCUITS



Announced are three new packaged electronic replacement circuits, having their primary applications in RCA and Philco TV sets. They are: No. PC-336, retrace suppression circuit; No. PC-337, phase comparator circuit; and No. PC-340, agc voltage divider. The firm states that these units have been added to their line of replacement PEC's in accord with the policy of including only those units that have a market of significant size. Centralab, 900 E. Keefe Ave., Milwaukee 1, Wis. (ELECTRONIC TECHNICIAN 9-8)

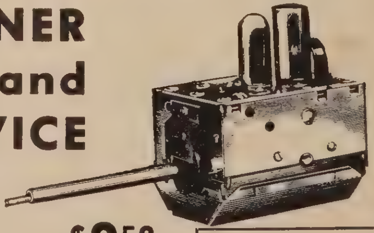
B&K TUBE TESTER



The new model 550 professional dynamic mutual conductance tube tester, for TV and radio tubes, operates on 105-125 volts 50-60 cycle a-c. It is equipped with 7-pin and 9-pin straighteners on the panel and with a 4½" plastic meter. A patented circuit provides automatic line voltage compensation. The most commonly used tube types, with settings, are listed directly on the socket panel and a reference chart is supplied in the case cover. $119.95. B&K Mfg. Co., 3726 No. Southport Ave., Chicago 13, Ill. (ELECTRONIC TECHNICIAN 9-15)

24 HR TV TUNER REPAIR and ALIGNMENT SERVICE

VHF or UHF — *All Makes*



90 DAY WARRANTY ISSUED ON ALL TUNERS

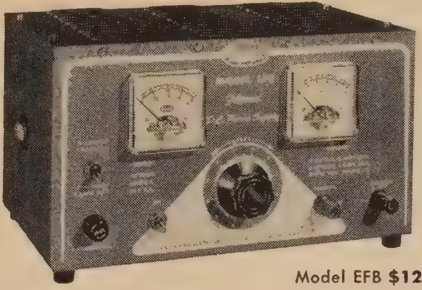
DEALER NET PRICE
VHF Tuners $9.50
UHF Tuners $9.50
UHF Converters $9.50
UHF-VHF Combinations $17.95

F.O.B. EVANSTON, ILL. WE SHIP C.O.D.

THE ABOVE SERVICE & PRICES ARE FOR UNMUTILATED UNITS. Missing, broken & damaged parts, defective tubes charged extra at LOW net prices.

IMPORTANT: SHIP COMPLETE. —INCLUDE ALL BROKEN PARTS. STATE MODEL & COMPLAINT. PACKAGE WELL TO AVOID TRANSIT DAMAGE.

JW Electronics 2404 Bradley, Evanston, Illinois


Model EFB **$120** Net

New! Super-Filtered DC for transistor design work

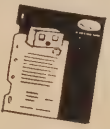
Less than 1/10% (10 mv.) AC ripple up to max. load

DC Power...for precision laboratory and design work

- Dual range — 0-32 volts up to 4 amperes
  0-16 volts up to 8 amperes
- Internal Impedance: 4 ohms at 32 volts
  2 ohms at 16 volts
- Smooth voltage control with continuously variable carbon brush-type auto transformer
- Long-life selenium rectifiers—patented heat sink cooling

Rack Mounted Model EFBR...$145 Net

Send for new detailed Bulletin EFB!



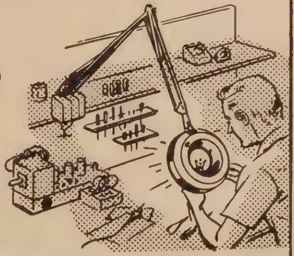
Electro®
ELECTRONIC EQUIPMENT

ELECTRO PRODUCTS LABORATORIES
4501-T Ravenswood, Chicago 40, Ill., LOngbeach 1-1707
Canada: Atlas Radio Ltd., Toronto

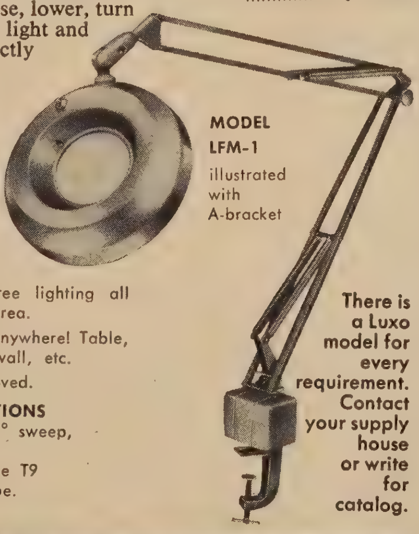
9587

LUXO
magnifying lamp

Ideal for visual accuracy during intricate assembly operations, for examination of exacting tolerances, calibrations and maintaining quality control.



With ease Luxo's spring balanced action lets you raise, lower, turn or tilt lamp to put light and magnification exactly where wanted.



OUTSTANDING FEATURES:

- Large precision ground lens.
- Excellent distortion-free, magnification.
- Brilliant shadow-free lighting all around viewing area.
- Can be mounted anywhere! Table, bench, machine, wall, etc.
- UL and CSA approved.

MODEL LFM-1
illustrated with A-bracket

SPECIFICATIONS
2 Extension arms, 360° sweep, 45 inch reach.
Lamp: 22 watt Circline T9 Fluorescent tube.
Color: Grey.

There is a Luxo model for every requirement. Contact your supply house or write for catalog.

LUXO LAMP CORPORATION
San Francisco, Cal. • PORT CHESTER, N. Y. • Montreal, Que.

the modern approach to
HI-FI STEREO
servicing

AUDIO
SYSTEM
ANALYZER
"800"

Here is a Complete Audio Laboratory of six instruments in one package! Our engineers have designed the "800" to save your *time* and to simplify the operational procedure of your shop. We know your time is your most valuable inventory. Look at the individual services the "800" performs at a fraction of the cost for all six instruments! . . . $169.95.

- it's an AUDIO VTVM
- it's an AUDIO OUTPUT WATT METER
- it's an AUDIO-SIGNAL GENERATOR
- it's an INTERMODULATION DISTORTION METER
- it's a HARMONIC DISTORTION METER
- it's a DB and NOISE METER
  and it's EASY to use

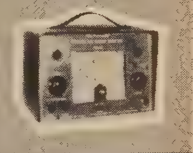
WINSTON ELECTRONICS
offers a complete line of test equipment
SEE YOUR LOCAL PARTS DISTRIBUTOR TODAY!
[illegible]

"720"

Dynamic sweep Circuit Analyzer . . . for color and black and white TV. Trouble shoot horizontal and vertical sweep circuits by signal substitution. This same instrument also is a complete compatible flyback and yoke tester! . . . $69.95.

"825"

Dynamic AGC Circuit Analyzer . . . AGC trouble shooting made painless! The "825" solves complex AGC problems fast because it combines AGC test signal, AGC circuit monitor, AGC pulse indicator, Bias clamp and supply, Continuity tester and VTVM . . . $79.95.

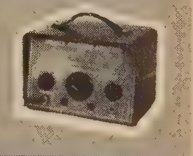


"115"

Intermittent Condition Analyzer . . . the fast way to locate intermittents and "borderline" components. Gives modulated test signal for TV or RADIO. "Electro-Wand" pickup loop checks tubes for noise and intermittents. "Electro-Probe" locates faulty components and loose connections without direct circuit connection . . . $89.95.

"510"

Induced Waveform Analyzer . . . adapts *any* "scope" to check waveforms from the top of the chassis. "Phantom-Probe" makes every tube a test-point without direct connection. Localizes trouble in minutes. Works on TV Channels 2 thru 13, 3.58-4.5 mc IF, 21 mc IF, 40 mc IF, Audio, Video, and Radio frequencies . . . $169.95.



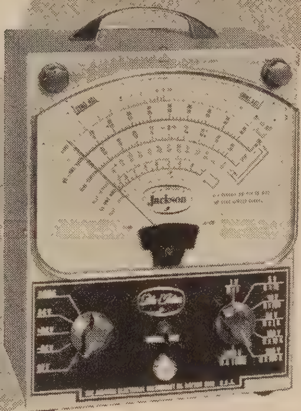
WINSTON ELECTRONICS
DIVISION OF
Vetronic INDUSTRIES, INC.
4000 N. W. 28th STREET • MIAMI, FLORIDA

2 new instruments from Jackson

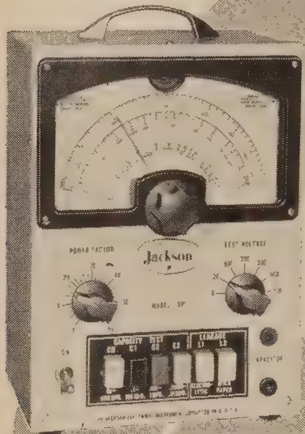
Peak-To-Peak and RMS VTVM

- Large 7" Meter and Hairline Pointer for greatest accuracy.
- Fast warm up time—complete accuracy in less than 5 minutes.
- Single probe for all measurements.
- Accurate AC voltage readings from 20 cycles to 2 mc.
- All-new tube and silicon diode circuitry.
- Factory calibrated for guaranteed accuracy. $69.95 NET

RANGES: DC Volts (±), AC volts, 1, 5, 10, 50, 100, 500, 1000 volts full scale. Separate 1V RMS Peak-To-Peak, and Zero-Center DC scales. Ohms: RX1, 10, 50, 100, 1k, 10k, 100k and 1 meg. Center of RX1 Scale, 10 ohms. Accuracy, DC and Ohms, 3% full scale; AC volts, 5% full scale.



MODEL 590



MODEL 591

Wide Range Capacitance Tester

- Tests capacity from 10 uuf to 1000 uf in 4 ranges.
- Color-coded range push-buttons match scale colors.
- Graduated leakage tests for polarized or non-polarized capacitors.
- Low voltage leakage test for transistor-type capacitors.
- Graduated Power Factor test, 0 to 60%.
- Electron Ray Tube Indicator for all tests.
- Factory Wired and calibrated for guaranteed accuracy. $64.95 NET

Coming Soon From Jackson—More New "Service-Engineered" Test Equipment

See Your Distributor or Write Today for Literature

Jackson

16-18 S. Patterson Boulevard
Dayton 2, Ohio

IN CANADA: The Canadian Marconi Company

free 16 PAGE SERVICEMAN'S CATALOG

ALL NEW, fully illustrated catalog of professional helps invented by servicemen for servicemen includes:
Fono-Magic to stop slipping turntables
Metal Strobe for 100% accuracy in turntable tuning
Kleentrol in spray can for easy control cleaning
Magna Lite frees both hands while lighting dark corners
E-Z Ply speaker cone cement
Nu-Shaft for radio clock knob shaft replacement
Switchmatic wall receptacle NOW gives any number of TV outlets from single antenna
Humi-Kup for weatherproof 2-set antenna coupling
Kleentrol Tape to clean recorder heads without dismantling
Miracle Lube handy oil for many service problems
Trolmaster cleaning—lubricating tool for application of Kleentrol Solvent
Cheater Cubes eliminate outlet hunting
Write for your FREE copy today.

R-Columbia Prod. Co., Inc.
305 Waukegan Ave.,
Highwood, Ill.
ASK FOR CATALOG No. 59

(Continued from page 65)

ESSENTIAL CHARACTERISTICS. *Published by General Electric Co., Owensboro, Ky. 260 pages, soft cover. $1.00.*

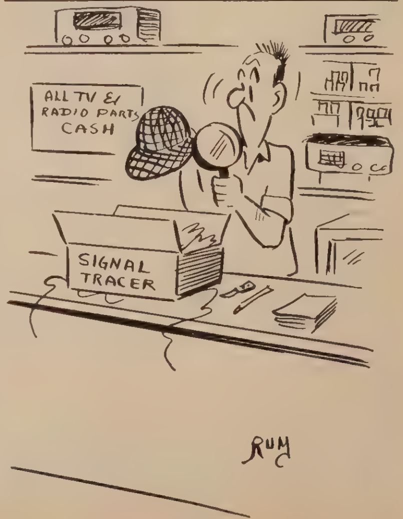
This new edition of GE's receiving tube, CRT and special purpose tube handbook offers the technician a quick-reference manual for tubes in current use. Basing diagrams, characteristics, and ratings of tubes are arranged in convenient reference form. The service technician will appreciate the new section on foreign tubes and their domestic equivalents.

***SERVOMECHANISM FUNDAMENTALS.** *By Zeines. Published by McGraw-Hill Book Co. 257 pages, hard cover. $5.50.*

The fundamentals of servo systems are described in this volume with a minimum of mathematics. This elementary treatment is presented in an effort to acquaint the maintenance or operating technician with basic servomechanism theory and is aided by numerous illustrations. Typical chapters are: Electronic and Magnetic Amplifiers; Control Systems; Performance Improvements; and Examples of Servos and Servosystems. An unusually detailed appendix is included. Any one interested in servo systems will find this book ideal as an introduction to the field.

***STEREO—HOW IT WORKS.** *By Herman Burstein. Published by Gernsback Library Inc. 224 pages. Soft cover, $2.90. Hard cover, $5.00.*

With stereo still an evolving art, this latest Library Series Book, No. 80, is a welcome volume. It covers stereo from its very beginning to the latest developments in the field. The text thoroughly describes the many facets of stereo, including such topics as: multiplexing, tape, microphone techniques, amplifiers, speakers and installing stereo systems. The subject matter is covered in an interesting manner and is aided by numerous illustrations. This clearly written book may be appreciated with only a basic knowledge of high fidelity. Yet, in view of its thorough and descriptive coverage of stereo, will find many technicians among its readers.


ALL TV & RADIO PARTS CASH
SIGNAL TRACER
RUM

Statistical Analysis

(Continued from page 62)

TV Dealer Sales To Public By Reason For Purchase — in thousand units —

	Initial Installation	Second Set	Replacement Set	Total
1946	5	—	—	5
1947	145	—	—	145
1948	865	—	—	865
1949	2,665	—	3	2,668
1950	6,075	30	27	6,132
1951	5,730	75	100	5,905
1952	5,640	230	275	6,145
1953	5,155	305	911	6,371
1954	5,420	410	1,497	7,327
1955	4,100	510	2,866	7,476
1956	4,550	900	1,440	6,890
1957	2,790	1,090	2,805	6,685
1958	2,390	1,070	1,900	5,360
1959	2,250	1,250	2,720	6,220
1960	1,970	1,340	3,430	6,740
1961	1,950	1,270	3,820	7,040
1962	1,770	1,320	4,630	7,720
1963	1,630	1,350	5,190	8,170
1964	1,530	1,390	5,560	8,480
1965	1,440	1,430	5,600	8,470
1966	1,470	1,480	5,550	8,500
1967	1,430	1,540	5,470	8,440
1968	1,370	1,560	5,540	8,470

Note: 1959-1968 estimated

Olson

* **FREE**

* Fill in coupon for a FREE One Year Subscription to OLSON RADIO'S Fantastic Bargain Packed Catalog — Unheard of LOW, LOW, WHOLESALE PRICES on Brand Name Speakers, Changers, Tubes, Tools, Hi-Fi's, Stereo Amps, Tuners and thousands of other Electronic Bargains.

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CITY__________ZONE____STATE________

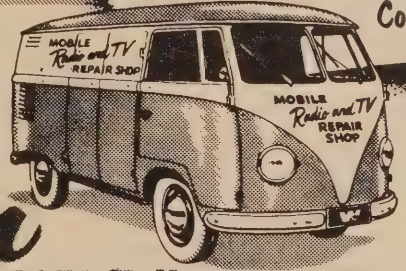
If you have a friend interested in electronics send his name and address for a FREE subscription also.

OLSON RADIO CORPORATION
500 S. Forge St., Akron 8, Ohio

Don't Miss This... Big Contest by WORKMAN TV INC.

Contest ends Oct. 15, 1959

THE BEST ENTRY IN THE OPINION OF THE JUDGES WILL . . .


MOBILE Radio and TV REPAIR SHOP
MOBILE Radio and TV REPAIR SHOP

Win This Brand New **1959 Volkswagen Truck!**

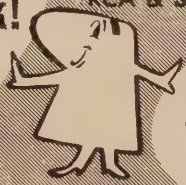
Equipped with...

- **JACKSON TEST EQUIPMENT** (Service Engineered, Selected for Quality)
  - 5" Scope Model #CRO-2
  - DYNAMIC Tube Tester Model #648P
  - ALL NEW 7" VTVM Model #590
  - Wide Range Capacitance Checker
- **500 WATT GASOLINE DRIVEN A.C. GENERATOR**

In 10 words or less tell why you like WORKMAN TV INC. products.

ENTRY BLANKS are in . . .

- GLOBAR #051 (20ΩHOT) 5 PACK
- ALL FUSED RESISTORS 10 PACK
- BELIMETER 5 PACK
- 7F5-5 PACK (special 7 watt RCA & SYLVANIA fused resistor)



Ask your Distributor for Complete Information on this "Chance of a Lifetime Contest!"

The more Entries you submit, the better are your chances of WINNING!

WORKMAN TV PRODUCTS, INC. Sarasota, Florida

TRY **"WISSH"** Contact Cleaner and Lubricant by **WORKMAN TV PRODUCTS, INC.**

IN THE NEW ECONOMY SIZE 16OZ. AEROSOL CAN....... only $1.95 dealer net

Model no H14
Stocked by leading parts jobbers.

As "The Man on the Roof" you would Prefer South River for making better television antenna installations

Take CHIMNEY BANDING for instance...

Why take this?

The troublesome watchspring effect—Some servicemen have to put up with banding that has a tight spiral "set". Bands of this kind can easily be spotted by their reluctance to stay put. Placement around the chimney is difficult and time consuming.

You can have this

This is the "free-opening" South River Band. Remove the retaining tape and you'll see it naturally unwinds for easy placement around the chimney. That's South River's way of making things easier for the man-on-the-roof.

Make It Easy for Yourself . . . Better for Your Customer

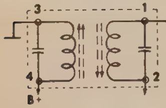
Insist on mountings and accessories made by

South River METAL PRODUCTS CO., INC.
South River, New Jersey

PIONEER MANUFACTURER AND OUTSTANDING PRODUCER OF THE FINEST LINE OF ANTENNA MOUNTING ACCESSORIES

CANADA: LEN FINKLER & CO., TORONTO

MODEL 12-C11



COLOR DOT
2
3
1
4

new MILLER
455 kc IF transformer

– an exact replacement for G. E. RTL-143 and RTL-163 – at your MILLER distributor

Here's the IF transformer used in a broad line of G.E. clock and table radios—available from any Miller distributor. It comes to you complete with schematic and base layout, to speed installation. List price: $2.30

This unit is one of many miniature IF transformers designed for replacement in "personal" radio receivers. The line includes:

MODEL	ITEM
12-H1	262 KC Input I.F. Trans.
12-H2	262 KC Output I.F. Trans.
12-C1	455 KC Input I.F. Trans.
12-C2	455 KC Output I.F. Trans.
6203	4.5 Input or Interstage
6205	4.5 Ratio Detector

MILLER QUALITY PRODUCTS

Write for the Miller general catalog, and the TV replacement guide, or get them at your distributor.

EXPORT REPRESENTATIVE:
Roburn Agencies, Inc., N.Y. 13, N.Y.

CANADIAN REPRESENTATIVE:
Atlas Radio Corp., Ltd., Toronto 10, Ont.

J. W. MILLER COMPANY
5917 S. Main St., Los Angeles 3, Calif.

Vacuum Cleaners

(*Continued from page 51*)

ally constructed of laminated iron in the form of an H and cut out at the top to accommodate an armature. Insulated wire is wound around the core, terminating in an a-c plug.

To test an armature for shorts, place the armature on the growler and turn on the current. Place a hacksaw blade over one of the armature slots, as shown in Fig. 3. If the coil in this slot has a short, the metal blade will vibrate with a growling noise. No sound or vibration indicates that the coil in the slot is not shorted. Move the blade to the next slot and continue this test until all slots have been checked.

The electronic technician hasn't the time, equipment or volume of work to warrant accomplishing major motor repairs. Minor repairs and determining the location of a motor defect though, are within his province. Vacuum cleaner parts distributors normally offer trade-ins for rebuilt or new motors, field coils and armatures. Trade discounts are usually applicable to service technicians.

Tools

The usual complement of hand tools carried by service technicians are used in vacuum cleaner work. Only the following additional supplies are necessary: series lamp tester, test leads, growler tester and brush seaters plus a small inventory consisting of replacement bags, carbon brushes and springs, switches, cord plugs and line cord wire. •

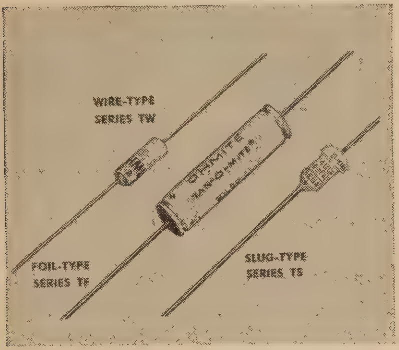
Vertical Deflection

(*Continued from page 47*)

ished to see an empty slot at pin 4. Trying to account for the absent socket pin, I could only conclude that the solder connection to the missing tab was inadequate and that the tab somehow cleared the narrow pin slot and was lost. A pin from a spare socket was installed and a piece of wire was firmly soldered between pin 5 and pin 4. The set provided full vertical deflection within a reasonable period of time and I vowed never to take heater voltage for granted again. —*Granville L. Frichette, Levittown, Pa.*

Ohmite CAPACITORS

Three new tantalum capacitors, are: Series TW, tantalum wire type, overall range 0.1 to 75 µf, voltages to 150 VDC and in 6 case sizes; Series TF, tantalum foil type, overall range 0.5 to 100 µf, various voltages from 6 to 150 VDC and in 3 case sizes; Series TS, slug capacitors in a range of 1.75 to 30 µf in two types—one rated for operation in 85°C ambient and the other rated for 125°C ambient. Ohmite Mfg. Co., 3645 Howard St., Skokie, Ill. (ELECTRONIC TECHNICIAN 9-9)

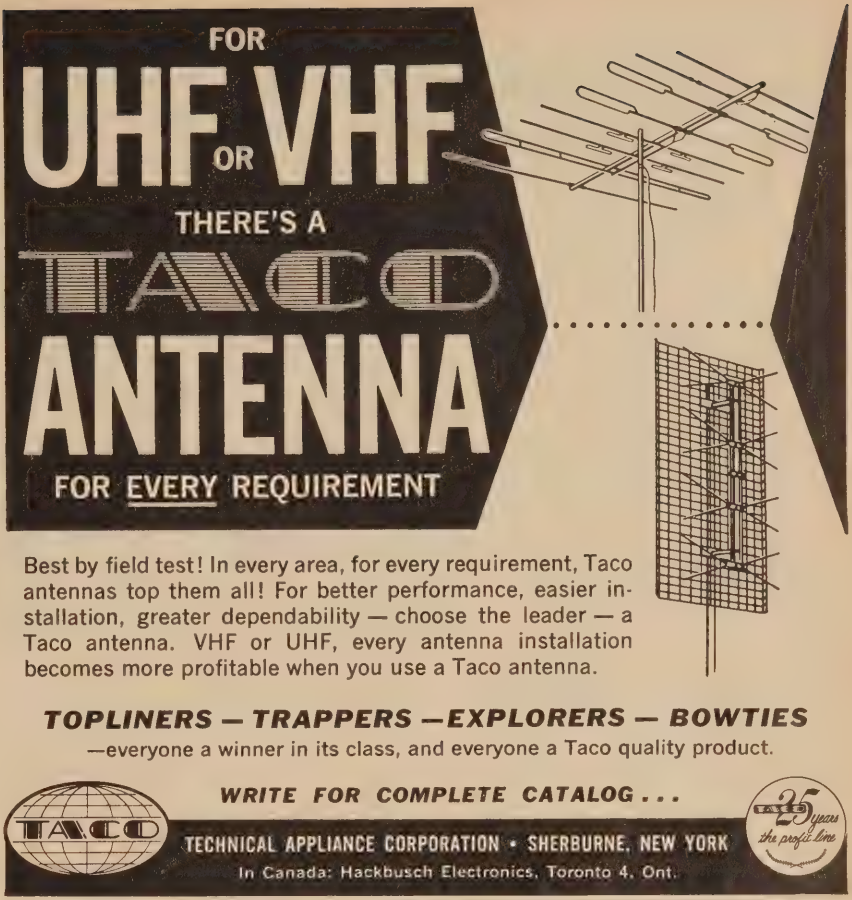


Vaco NUT DRIVERS

V-108 Vari-board, with two shelves, holds an assortment of 86 nut drivers on a 12"x24" panel. It is supplied with or without legs for counter or wall use. The tools are available in either chrome-tone or gold-tone. They have plastic handles, colored for size; solid, drilled 1½" deep and all-hollow shafts and tempered sockets that are extra hard to prevent "rounding-out." Vaco Products Co., 317 E. Ontario St., Chicago 11, Ill. (ELECTRONIC TECHNICIAN 9-3)

CC-TV FOR TECHS

500 TV technicians attended Boston session of Raytheon's closed circuit TV meeting. Scene was duplicated in more than 85 other cities as 10,000 techs attended national service dealer meeting to learn of company's new Bonded Dealer program which provides 90-day guarantees for retail customers.


FOR UHF OR VHF THERE'S A TACO ANTENNA FOR EVERY REQUIREMENT

Best by field test! In every area, for every requirement, Taco antennas top them all! For better performance, easier installation, greater dependability — choose the leader — a Taco antenna. VHF or UHF, every antenna installation becomes more profitable when you use a Taco antenna.

TOPLINERS — TRAPPERS — EXPLORERS — BOWTIES
—everyone a winner in its class, and everyone a Taco quality product.

WRITE FOR COMPLETE CATALOG . . .
TACO
TECHNICAL APPLIANCE CORPORATION • SHERBURNE, NEW YORK
In Canada: Hackbusch Electronics, Toronto 4, Ont.
TACO 25 years the profit line

XCELITE® PLIERS have a . . . New CUSHION GRIP!

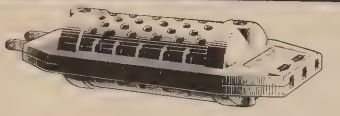
No. 62CG illustrated
Transverse Cutter

Plier handles have dipped plastic coating . . . permanent, comfortable. Heads polished and buffed to a "mirror finish". All pliers available . . . See Your Distributor!

Gives pliers a "Feel" that inspires Craftsmanship!

XCELITE, INCORPORATED
ORCHARD PARK, NEW YORK
Canada: Charles W. Pointon, Ltd., Toronto
XCELITE Quality Hand Tools PREFERRED BY THE EXPERTS

DON'T GUESS . . .
KNOW THE TEMPERATURE OF YOUR SOLDERING GUN BEFORE TOUCHING PRINTED CIRCUITS AND LAMINATED WIRING BOARDS!



ESICO **GUNCHOKE**®
REDUCES TEMPERATURE OF YOUR SOLDERING GUN TO TWO CONSTANT HEATS - 500° OR 600°

- Assures correct temperature for soldering printed circuits and laminated wiring boards.
- No need to wait for a slow-heating iron — and still have doubtful temperature.
- Just plug into GUNCHOKE and GUNCHOKE into outlet.
- Small, compact, to fit in your tool kit.

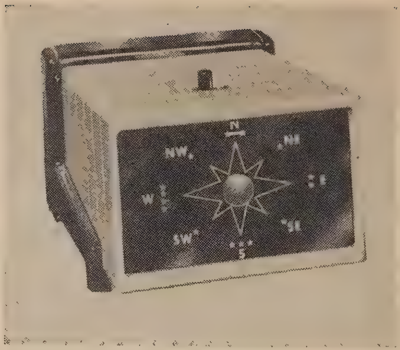
FOR ALL WIDELY USED GUNS
Get GUNCHOKE from your distributor

ESICO
LUGER GUN

Perfect balance permits delicate touch for most intricate work. Transformer built in handle eliminates tip heaviness. Long, thin tips simplify soldering connections inaccessible with other guns. LUGER is 150-watt capacity.

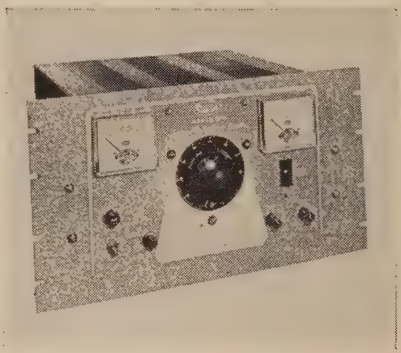
ELECTRIC SOLDERING IRON CO., INC.
659 W. Elm Street :—: DEEP RIVER, CONN.

Channel Master ROTATOR



Announced is the "Electric-Eye Tenn-A-Liner," model 9523, claimed to be the industry's first 45° flasher rotator. The electric-eye glows softly when the current is turned on. A touch of the finger-tip control bar turns the rotator and the electric-eye indicates the antenna position. Has high torque; and parallel circuit design to deliver 29 v. to the rotator. $33.95. Channel Master Corp., Ellenville, N. Y. (ELECTRONIC TECHNICIAN 9-1)

Electro POWER SUPPLY



Model NFBR, for rack mounting, is a specially filtered d-c power supply with less than ¾% ripple at top load. It is designed for voltages of 0 to 32 v. d-c with current loads from 0 to 15 amperes. Input is 115 v., 50/60 cycles. It features germanium rectifiers, fully protected by a fast-action circuit breaker in the output circuit and a fuse in the input circuit. The rack mounting panel incorporates a full-view volt meter and ammeter, an on-off switch and a pilot light. Electro Products Labs., 4500 N. Ravenswood Ave., Chicago 40, Ill. (ELECTRONIC TECHNICIAN 9-17)

for the first time!
COMPLETE, SKIN-TIGHT, ONE-PIECE VINYL INSULATION FOR FULL-SIZE ALLIGATOR CLIPS

SNUG AND TOUGH AS AN ALLIGATOR SKIN!

Mueller's New No. 72 Insulator for 70-Series Alligator Clips...
(Sold separately. Red, Black, and four special colors.)

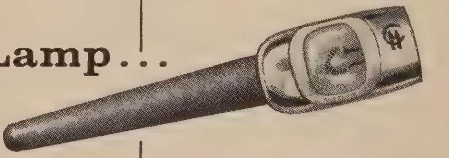
THIS IS TRUE "ALLIGATION"!
FOR LOWER COST THAN ANY OTHER COMPLETELY INSULATED ALLIGATOR!

INSULATOR COVERS RIGHT DOWN TO THE NOSE!
FULL JAW SPREAD
MUELLER
TEETH COVERED. JAWS OPEN OR CLOSED
FULL SIZE ALLIGATOR CLIP
TOUGH, FLEXIBLE, SKIN-TIGHT ONE-PIECE VINYL INSULATOR .. ONLY 023" THIN

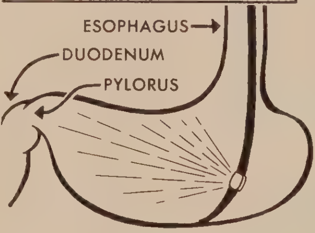
FREE SAMPLE... insulator and clip ... on request.

Mueller Electric Co.
1575Y East 31st Street
Cleveland 14, Ohio

This Lamp . . .



Lights Up Your Interior!



Lamp located at end of gastroscope, has a flexible rubber finger that guides end of instrument across floor of stomach while the lamp illuminates wall of stomach for viewing through gastroscope. Even color pictures can be taken through the instrument!

When the gastroscope was invented—the instrument that enables a physician to take an actual, close-up peek at our expensively-acquired ulcers—a special miniature lamp was needed to illuminate the interior of the stomach and expose the results of our follies!

Chicago Miniature was asked to design that lamp, and, since then, has made many more for this purpose.

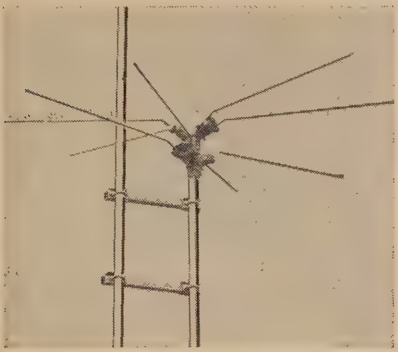
Noted for its ability to design and produce precision lamps to exacting specifications for special and unusual functions, Chicago Miniature also produces the broadest line of standard lamps in the industry to the same high standards of quality.

When you need miniature lamps for replacement purposes, you can always be sure of dependable quality when you ask your parts jobber for Chicago Miniature Lamps.

CHICAGO MINIATURE LAMP WORKS
1516 North Ogden Ave., Chicago 10, Ill.
Miniature Lamps for every requirement

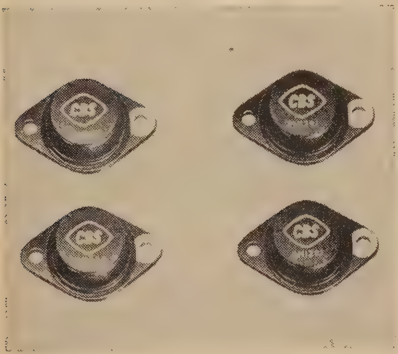
JFD FM ANTENNAS

A new series of FM gold-anodized antennas, for primary, secondary and fringe areas, incorporates the new Stereo Cone Turnstile. The 8 multi-element stereo cone dipoles enable the antenna to receive any FM station from any direction. Fully covered in bulletin #819. $15.95 for the AFM100 Stereo Cone Kit for new installations; $13.95 for the AFM150 Stereo Cone "Attach-It" for present outdoor TV antennas; $14.95 for the AFM200 Stereo Folded Dipole Kit; and $23.50 for the AFM300 FM Yagi. JFD Electronics Corp., 6101 16th Ave., Brooklyn 4, N. Y. (ELECTRONIC TECHNICIAN 9-2)

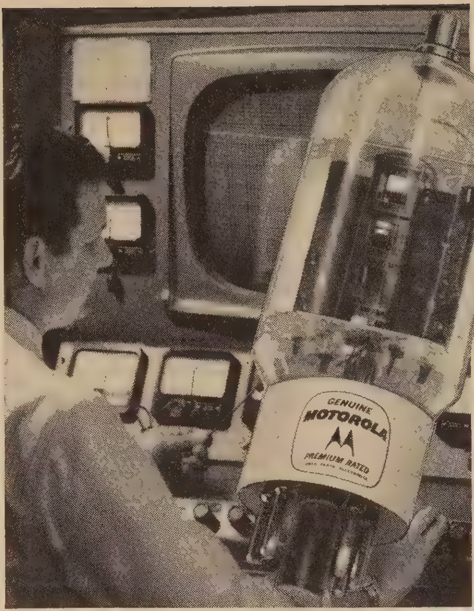


CBS TRANSISTORS

The first in a series of complementary NPN-PNP power transistors has been announced. These complementary pairs eliminate input and output transformers in push-pull circuits to save money and space, while at the same time providing improved frequency response. Negative feedback can be more easily applied using them. The pairs feature high voltages—up to 100 v., and proven reliability (exceeding MIL-T-19500A) for audio, control, voltage-regulation, servo and computer applications. CBS Electronics, Semiconductor Operations, 900 Chelmsford St., Lowell, Mass. (ELECTRONIC TECHNICIAN 9-10)



For more information, write in ELECTRONIC TECHNICIAN's code number at end of item on inquiry card, page 83.



Only Motorola

Torture Tests to Twice Maximum Ratings

Unique electronic testing device "works over" every Golden "M" Tube, assures 100% reliability

MOTOVAC, the Motorola-created electronic brain, torture-tests Golden "M"* Tubes to specifications that are the *highest in the entertainment-type tube industry.* Result? The *most reliable* tubes you can buy! The kind that give you far lower "in-use" and "shelf-defective" rates than ever before.

*TRADEMARK OF MOTOROLA, INC.

MOTOROLA

CONFIDENCE BRAND NAMES SATISFACTION REG. PENDING

Parts and Accessories Division, Franklin Park, Illinois

KESTER
FLUX CORE
SOLDER

after 60 years

it's the radio-tv serviceman's "best friend"!

KESTER SOLDER

KESTER "RESIN-FIVE" FLUX-CORE SOLDER enjoys almost 100% acceptance by the radio-television-electronics service industry. Servicemen like its fast action and easy application . . . its non-corrosive, non-conductive activated flux does a perfect job every time.

Send for detailed information on Kester "Resin-Five" Flux-Core Solder.

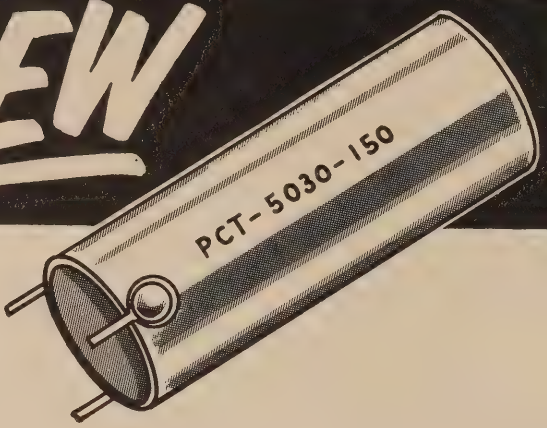
KESTER SOLDER CO.

4264 Wrightwood Ave., Chicago 39, Illinois
Newark 5, N.J. Anaheim, Cal| Brantford, Canada

Since 1899 60th Anniversary KESTER SOLDER

OVER 60 YEARS' EXPERIENCE IN SOLDER AND FLUX MANUFACTURING

NEW



Type "PCT" . . . constructed in strong red cardboard tubes, wax impregnated, one end closed, printed circuit board terminals.

Type "PCTL" . . . has insulated lead out top providing for low voltage section.

For 65°C operation . . . recommended for table and clock radios . . . individually packaged . . . guaranteed for one year.

ALL PLANET capacitors are
- **engineered for quality**
- **guaranteed for one year**

Call your DISTRIBUTOR!

PLANET SALES CORPORATION
225 Belleville Avenue
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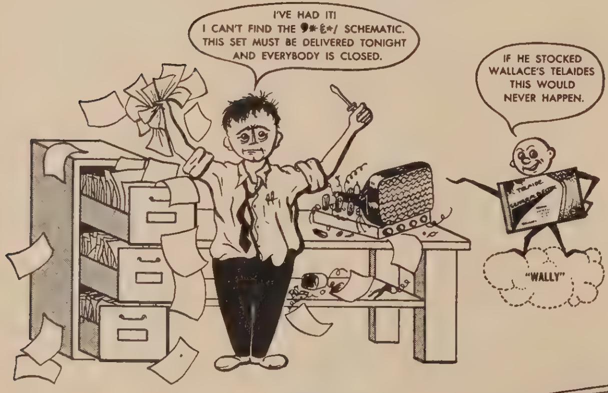
THE SERVICEMAN WHO KNOWS...
PREFERS Wallace's TELAIDES FOR SCHEMATICS AND SERVICE INFORMATION PUBLISHED EXPRESSLY FOR THE SERVICEMAN


I'VE HAD IT! I CAN'T FIND THE 9*&*/ SCHEMATIC. THIS SET MUST BE DELIVERED TONIGHT AND EVERYBODY IS CLOSED.
IF HE STOCKED WALLACE'S TELAIDES THIS WOULD NEVER HAPPEN.
"WALLY"

EACH TELAIDE CONTAINS:
- PARTS LISTS
- SCHEMATICS
- SERVICE HINTS
- PICTORIAL VIEWS
- TUBE LOCATIONS
- VOLTAGE READINGS
- PRODUCTION CHANGES
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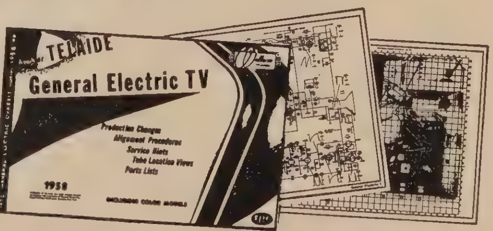

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HV associates inc.
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THE MOST COMPLETE TELEVISION REPAIR LIBRARY AVAILABLE... AT ANY PRICE.

Association News

California

TSA, San Francisco, distributed a questionnaire to sixty-five service dealers in the San Francisco area in an effort to determine the general local conditions of the industry. Some of the questions and replies resulting from this survey are as follows: "Do you think the minimum price for service calls should be $4.50, $5.50, $5.95 or other?" 46 of the 65 service dealers questioned answered either $5.50 or $5.95. "Do you service TV sets for furniture and appliance stores?" 26 replied "yes"/39 "no." Do you wish TSA, San Francisco, to negotiate your union contract?" 23 replied "yes"; 28 "no"; 14 "undecided" or "no comemnt". "Do you favor licensing of TV technicians and shops?" 44 replied "yes"; 19 "no"; 2 "undecided" or "no comment."

ITSD, Los Angeles County, reports congratulating the California State Legislature on their passage of Senate Bill #33. This bill provides for regulation of business practices through the appointment of a Consumer Counsel.

Florida

RTTG, Miami, reports pro-licensing attitude. Pres. A. Edward Stevens advises in summary, that sooner or later a licensing law will be drawn and it would be better to have the law framed by those familiar with the profession, rather than politicians, who may propose one which no one can live with.

Indiana

ITTA, Indiana, submits amendment proposal to NATESA which would permit more than one affiliate to be recognized from any given area, at the discretion of the Executive Council.

Michigan

TESA, Michigan, in a letter to NATESA, alleges TSA, Michigan officers "have shown proof by their past performances . . . would join another group only for the purpose of trying to gain control even if they have to wreck the other group in the process." . . . "TSA leaders don't cooperate; they dominate."

New Jersey

The Electronic Guild, New Jersey, started earlier in 1959, is now issuing charters to local groups in the State who meet their requirements. One of the association's ultimate goals is State licensing. Officers are: Pres.,

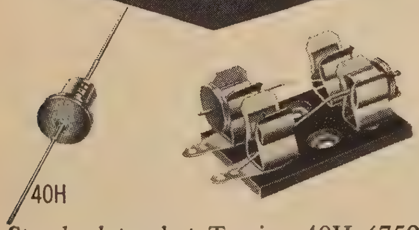
Tarzian

Offers You
A Complete Range
of Silicon Rectifier
Mounting Types

THIS...

The cartridge-type Tarzian M-500 (500 ma) snaps into popular fuse holder brackets.

OR THIS...



Standard top-hat Tarzian 40H (750 ma) is directly interchangeable where a metal case is required.

OR THIS...

Tarzian F4 (750 ma) insulated case tucks in out of the way against chassis. Leads are solder type.

Write for complete information

SARKES, TARZIAN, INC.
RECTIFIER DIVISION
DEPT. T-5, 415 NORTH COLLEGE AVENUE
BLOOMINGTON, INDIANA
In Canada: 700 Weston Rd., Toronto 9. Tel. Roger 2-7535
Export: Ad Auriema, Inc., New York City

Augustus F. Pengitore; V. P., Gary Del Virginia; Sec'y., Eugene A. Sansone and Salvitore Ricca; Treas., Paul Garafola.

Ohio

TESA, Ohio, to hold fall State convention at Sheraton Hotel, Akron, Ohio, October 3, 4.

Pennsylvania

ESDA, Pittsburgh, puts "self-licensing" into effect as a step towards their final goal, "State licensing."

Raytheon TRIODE

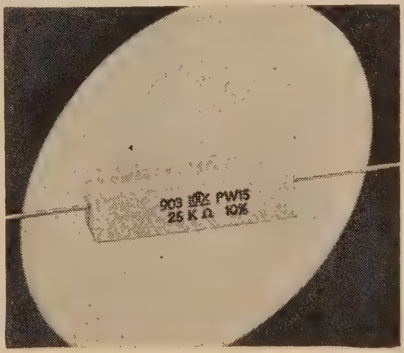
Type CK7246, a new filamentary subminiature triode, is designed for use in portable communication equipment as a super-regenerative detector, high frequency oscillator, class C amplifier, frequency multiplier, or mixer. It operates up to 500 mc. The frequency range makes it particularly desirable for transceiver use in the 465 mc citizens radio band. Raytheon Co., Industrial Tube Div., Newton, Mass. (ELECTRONIC TECHNICIAN 9-24)

Electronic Chemical EXTENDER

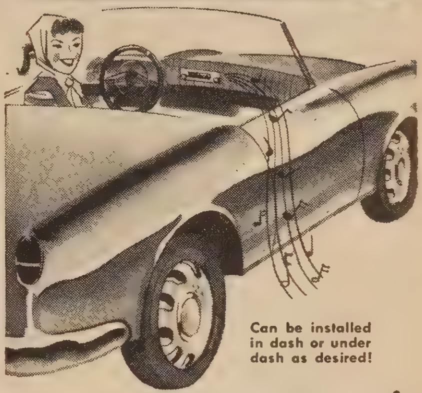
A 5" plastic extender, for use with aerosol packaged products, is offered free to users of the firm's products: No-Noise Volume Control and No-Noise Tuner Tonic. The extender fastens to the top of the spray can and it has a push-button assembly. Electronic Chemical Corp., 813 Communipaw Ave., Jersey City, N. J. (ELECTRONIC TECHNICIAN 9-30)

IRC RESISTORS

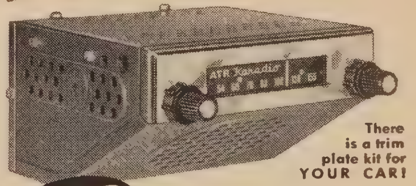
Model PW15 is a small high-temperature wire wound resistor rated at 15 watts. Available in values from 1 to 25,000 ohms, with standard 10% tolerance, or 5% on special order. Features include: alloy coated leads for positive soldering, secured to a resistance element, wound on a glass fibre core and sealed in a rectangular case. Materials are inorganic for fullest protection against flame or decomposition at overload conditions. International Resistance Co., 401 N. Broad St., Philadelphia 8, Pa. (ELECTRONIC TECHNICIAN 9-7)



Introducing
ATR CUSTOMIZED
Karadio


Can be installed in dash or under dash as desired!

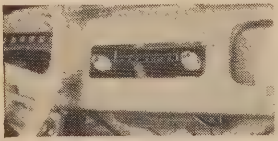
for *small import cars*
and *compact U.S. cars*


There is a trim plate kit for YOUR CAR!

ATR CUSTOMIZED
Karadio

• VIBRATOR-OPERATED with Tone Control

The ATR Customized Karadio is a compact, new, self-contained airplane-styled radio for small import and compact American cars. This economical unit is perfect for all small cars because it can be easily and inexpensively installed in-dash or under-dash on most any make or model automobile—and its powerful 8-tube performance provides remarkable freedom from engine, static, and road noises. ATR Karadios are built to look and fit like original equipment with sleek, modern styling and solid, single-unit construction. They offer many customized features and provide highest quality fidelity—yet cost far less than comparably designed units. The ATR Customized Karadio comes complete with speaker and ready to install . . . and is the ideal way to add fun and value to your small import or American automobile!



ATR KARADIO . . . is ideal for small import cars or compact American cars! Unit is completely self-contained—extremely compact! Can be mounted in-dash or under-dash—wherever space permits! For 6 volt or 12 volt!

SEE YOUR JOBBER OR WRITE FACTORY

• "A" Battery Eliminators • DC-AC Inverters • Auto Radio Vibrators

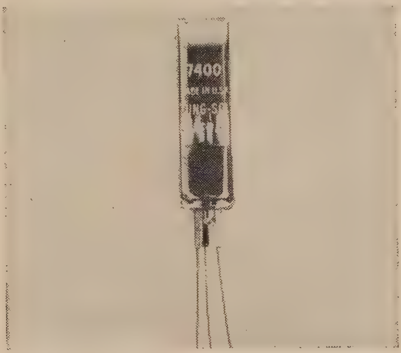
ATR
AMERICAN TELEVISION & RADIO CO.
Quality Products Since 1931
SAINT PAUL 1, MINNESOTA, U. S. A.

RCA TUBES

8HP4, shown, rectangular glass tube with spherical filterglass faceplate, is designed primarily for compact TV monitor equipment. It has an aluminized screen 7$\frac{3}{16}$"x5$\frac{3}{8}$" with slightly curved sides and rounded corners. Minimum projected screen area, 35.5 sq. in. 90° deflection. 10¼" long. 2½ lbs. Also, not shown, 24BAP4, 110° picture tube for use in cathode-drive applications; 7358, small beam power tube for pulse-modulation applications. 7357, small beam power tube, equivalent to type 6159, for applications where dependable performance under severe shock and vibration is essential. Radio Corp. of America, Electron Tube Division, Harrison, N. J. (ELECTRONIC TECHNICIAN 9-22)

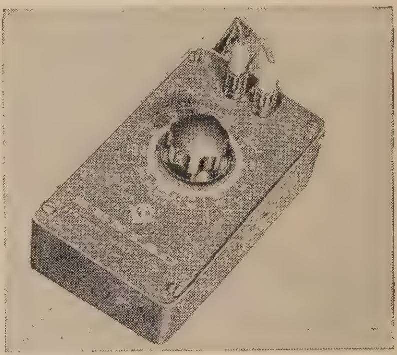
Tung-Sol TUBES

7400, shown, is one of three new self-indicating thyratrons announced by the firm's Chatham division. 7401, a subminiature version, and 7323 the hot-filamentary type are the other two. 7400 and 7401 cold cathode types require no heater power and provide a bright surface glow indication for end-on viewing. A small pulse voltage, such as can be generated by transistorized equipment, is superimposed on the d-c bias to trigger these tubes. 7323, the filamentary-type indicator requires ⅓ watt filament power and 4-5 v. d-c grid bias. Trigger signals can be applied directly at ground reference level. Tung-Sol Electric Inc., 95 8th Ave., Newark 4, N. J. (ELECTRONIC TECHNICIAN 9-23)



Int'l Rectifier DIODES

The second in a series of the firm's Zener diode substitution boxes is Model B Zeniac, shown. It offers a selection of 11 basic 10-watt silicon zener diodes, covering the zener voltage range from 3.6 to 30 volts. Housed in a compact, easily portable unit which may be inserted into any breadboard circuit, the decade-type substitution box contains a selector switch enabling interchange of any one of the 11 component diodes. The original Model A, 1-watt Zeniac and the new 10-watt Model B Zeniac are now available. International Rectifier Corp., 1521 E. Grand Ave., El Segundo, Calif. (ELECTRONIC TECHNICIAN 9-26)



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..."Jewels
In Tools"

VACO® NUT DRIVERS

- 5 beautiful nut drivers nested in attractive 2-tone plastic box with hinged cover
- Each driver identified for size by color of handle
- Highly polished chrome shafts (drilled 1½" deep) for good looks, long life
- Extra hard, machined sockets that "won't-round-out"

VACO
New Design!
Nut Drivers
VACO
SPECIAL
OFFER

SP 500
$3.95 NET

Special Offer!
Voltage Checker and Probe INCLUDED with purchase of two New Design VACO Nut Drivers. This is a $2.50 value for only $1.79 net. Instructions for using Voltage Checker included. A real "buy"!
SP 3 ONLY—$1.79

See Your Jobber, Today!

VACO PRODUCTS COMPANY, 317 E. Ontario St., Chicago 11, Ill.
In Canada: ATLAS RADIO CORP., Toronto 19, Ontario

SO SAFE!

won't damage glass tubing

let alone wire or cable!

ARROW STAPLE GUNS can't damage wire or cable because driving blade automatically stops staple at right height! That's why Arrow Staple Guns are proved safer on jobs all over the country. And Arrow staples have tremendous holding power because they're rosin-coated, have diverging points that lock into wood.

T-25 (shown) **for wires up to ¼" in diameter.** (Hi-Fi wire, radiant heating, bell, thermostat, telephone, inter-com, etc.) tapered striking edge gets into tight corners. Uses ⅜", $\frac{7}{16}$", and $\frac{9}{16}$" staples, List $15
T-25B For burglar alarm wiring. Drives staples flush . . . List $15
T-75 For non-metallic sheathed cable, Romex cable or any other object (such as copper tubing) up to ½" in diameter. Uses $\frac{9}{16}$", ⅝", and ⅞" Arrow staples . . . . List $15

ARROW FASTENER COMPANY, INC.
1 Junius St., Brooklyn 12, N.Y.

MORE
OF EVERYTHING
YOU WANT IN A
V-O-M

- New Mirrored Scale Plate
- Wider Frequency Response AC Ranges
- New DC Polarity Reversing Switch
- 59 Extended AC and DC Ranges

...and at
NO INCREASE IN PRICE

THE NEW
PRECISION
MODEL 120

20,000 ohms/volt DC • 5,000 ohms/volt AC

plus:
all the famous features of
the original *PRECISION* 120.

- An Extra-Low Resistance Range: 2 ohms at center scale.
- An Extra-Low Voltage Range: 1.2 volts full scale, AC and DC.
- An Extra-High Voltage Range: 6,000 volts full scale, AC and DC.
- An Extra-Large 5¼" Meter with wide-angle, easy-reading scales.

Model 120: Complete with batteries, test leads and tech manual. Overall case dimensions: 5⅜" x 7" x 3⅛"........**Net Price $44.95**

Model 120M: For special applications which require a V-O-M approaching laboratory accuracy................**Net Price $52.95**

▶ Available and on display at leading electronic parts distributors. Write for complete *PRECISION* catalog.

PRECISION
Apparatus Company, Inc.
70-31 84 St., Glendale 27, L. I., N. Y.
Export: 458 Broadway, New York 13
Canada: Atlas Radio Corp., Toronto 19

Catalogs & Bulletins

ELECTRONIC PARTS & ACCESSORIES: A 72-page 1960 Parts & Accessories Catalog, just released, lists more than 1,500 different electronic items. It is the first parts and accessories catalog published by this firm. Included is the latest data on replacement parts for all of the company's electronic products and a special 20-page section of cross-reference information on universal replacement parts. Admiral Corp., 3800 Cortland St., Chicago 47, Ill. (ELECTRONIC TECHNICIAN B9-1)

ELECTRONIC COMPONENTS: A new 24-page catalog lists over 1,700 composition and wirebound controls, ceramic capacitors, switches, and packaged circuits. It contains 128 new products. Detailed electrical and physical specifications are given for each item. Centralab, 900 E. Keefe Ave., Milwaukee 1, Wis. (ELECTRONIC TECHNICIAN B9-3)

TV HOME ANTENNA: Designing a central TV antenna system for the home by applying the firm's TV-FM home outlet is the subject of a two-page "Technical Reporter" bulletin. Six different applications are described. Photos and diagrams are included. Jerrold Electronics Corp., 15th & Lehigh Ave., Philadelphia 32, Pa. (ELECTRONIC TECHNICIAN B9-4)

CAPACITORS & TUNERS: Literature is available giving descriptions and illustrations of precision trimmer piston capacitors and the new L-C Tuner series. JFD Electronics Corp., 1462 62nd St., Brooklyn, N. Y. (ELECTRONIC TECHNICIAN B9-5)

ELECTRONIC COMPONENTS: A new brochure describes welded assembly technique for high density packaging of electronic components. The packaged assemblies, miniaturized by precision welding of components into modular "sticks," are encapsulated with plug-in terminals. Raytheon Co., Industrial Tube Div., 55 Chapel St., Newton 58, Mass. (ELECTRONIC TECHNICIAN B9-6)

LAMPS: Electrical and physical characteristics for 284 miniature and sealed beam lamps are contained in the new A-21 Lamp catalog. Includes technical information on the relationship of applied voltage to life, current and light-output. Tung-Sol Electric Inc., 95 Eighth Ave., Newark 4, N. J. (ELECTRONIC TECHNICIAN B9-7)

TEST EQUIPMENT: A new 4-page catalog, #59A provides descriptions, illustrations, specifications and prices of the company's full line of tube testing equipment. Vis-U-All Products Co., 640 Eastern Ave., S.E., Grand Rapids 6, Mich. (ELECTRONIC TECHNICIAN B9-8)

A BIG, NEW
PROFITABLE
MARKET
*and the perfect
equipment to serve it!*

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GONSET
Citizens' Communicator
2-WAY RADIO

Now . . . FCC assigns 22 channels within 11-meter range for Class D use—personal or business! Easy to license . . . no exam, U.S. Citizens merely complete simple FCC form.

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Multiple and repeat sales . . .

G-11 units can operate together as a system. Examples: industrials . . . buildings . . . yards, warehouses . . . aviation . . . branch businesses. Every industrial account you have is a hot prospect!

Dependable . . .

FCC type accepted. No tuning, full crystal control . . . RF stage . . . ANL . . . adj. squelch . . . panel speaker . . . p-t-t control . . . built-in power supply. 5 watts input (FCC max). 3 models—115 VAC, 12 VDC, and 6 VDC . . .

124.50 per unit
w/mike & trans/rec crystals for 1 channel

Send today for complete information and free booklet.

GONSET DIVISION DEPT. ET-1,
Young Spring & Wire Corp.
801 South Main Street, Burbank, Calif.

Gentlemen: Rush complete details on your technician/dealer plan and free booklet: "11-meter Citizens' Band Radio"

NAME
ADDRESS
CITY ZONE STATE

GONSET
Division of Young Spring & Wire Corporation
801 SOUTH MAIN ST., BURBANK, CALIFORNIA

INDEX TO ADVERTISERS

September, 1959

- **Aerovox Corp.** . . . 58
  - Agency: Lescarboura Advertising, Inc.
- **American Television & Radio Co.** . . 79
  - Agency: Firestone Goodman Adv Agency, Inc.
- **Amperex Electronic Corp.** . . . 62
  - Agency: Sam Groden, Inc.
- **Apparatus Development Co.** . . . 146
- **Arrow Fastener Co.** . . . 80
- **Astatic Corp.** . . . Cover III
  - Agency: R. J. McCallister Co.
- **Atlas Sound Corp.** . . . 142
  - Agency: Zam & Kirshner, Inc.

- **B & K Manufacturing Co.** . . . 63
  - Agency: Henry H. Teplitz Adv Agency
- **Belden Manufacturing Co.** . . . 61
  - Agency: The Fensholt Adv Agency, Inc.
- **Bogen-Presto Co.** . . . 132
  - Agency: Friend-Reiss Advertising, Inc.
- **British Industries Corp.** . . . 97
  - Agency: Mogul Lewin Williams & Saylor, Inc.
- **Bussmann Manufacturing Co.** . . . 17
  - Agency: Henderson Advertising Co.

- **CBS Electronics** . . . 21, 145
  - Agency: Bennett & Northrop, Inc.
- **Centralab Div., Globe-Union, Inc.** . . 60
  - Agency: Stral Advertising Co.
- **Century Electronics Co.** . . . 68, 69
  - Agency: Nat Kermin Advertising
- **Channel Master Corp.** . . . 2, 3, 4, 5
  - Agency: Duso Advertising Inc.
- **Chemical Electronic Engineering, Inc.** 29
  - Agency: Madison Advertising Agency
- **Chicago Miniature Lamp Works** . . . 76
  - Agency: Merchandising Advertisers Inc.
- **Cornell-Dubilier Electric Corp.** . . . 6
  - Agency: Friend-Reiss Advertising, Inc.

- **Delco Radio Div., General Motors** . . 31
  - Agency: Campbell-Ewald Co.
- **Duotone Co.** . . . 142
  - Agency: Halsted & Van Vechten, Inc.

- **EICO** . . . 139
  - Agency: Zam & Kirshner, Inc.
- **Electric Soldering Iron Co., Inc.** . . 76
  - Agency: Henry F. Johnson Adv Service
- **Electro Products Laboratories** . . . 71
  - Agency: Robertson, Buckley & Gotsch, Inc.
- **Electro-Voice, Inc.** . . . Cover II
  - Agency: Henry H. Teplitz Adv Agency
- **Erie Resistor Corp.** . . . 143
  - Agency: Meldrum & Fewsmith, Inc.

- **Fisher Radio Corp.** . . . 90
  - Agency: Vanguard Advertising

- **Garrard Sales Corp.** . . . 97
  - Agency: Mogul Lewin, William & Saylor Inc.
- **General Electric Co., Audio Components Section** . . . 103
  - Agency: Brooke, Smith, French & Dorrance, Inc.
- **General Electric Co., Electronic Components Div.** . . . 14, 15, 24
  - Agency: Maxon, Inc.
- **General Electric Co., Television Receiver Dept.** . . . 30
  - Agency: Young & Rubicam, Inc.
- **Gonset Division** . . . 81
  - Agency: Clayton F. Bane Advertising Agency

- **Greyhound Corp.** . . . 7
  - Agency: Grey Advertising Agency, Inc.

- **Harman-Kardon, Inc.** . . . 147
  - Agency: The Wexton Co., Inc.
- **Heath Co.** . . . 144
  - Agency: Advance Advertising Service, Inc.
- **HV Associates** . . . 78
  - Agency: Richard Stinson, Jr.

- **International Resistance Co.** . . . 8, 9
  - Agency: Arndt, Preston, Chapin, Lamb & Keen, Inc.

- **Jackson Electrical Instrument Co.** . . 72
  - Agency: R. L. Conhaim Advertising
- **Jensen Industries, Inc.** . . . 101
  - Agency: Wright, Campbell & Suitt, Inc.
- **Jensen Manufacturing Co.** . . . 105
  - Agency: Burton Browne Advertising
- **Jerrold Electronics Corp.** . . . 20
  - Agency: Lavenson Bureau of Advertising Inc.
- **JFD Electronics Corp.** . . . 33, 34
  - Agency: Delphi Advertising, Inc.
- **JW Electronics** . . . 70

- **Kester Solder Co.** . . . 77
  - Agency: Paul J. Steffen Co.

- **Lansing Sound, Inc., James B.** . . . 135
  - Agency: John S. Monsos, Advertising
- **Luxo Lamp Corp.** . . . 71
  - Agency: Davidor Advertising Agency, Inc.

- **Mallory and Co., Inc., P. R.** . . . 48, 49
  - Agency: The Aitkin-Kynett Co., Inc.
- **Marjo Technical Products Co.** . . . 64
  - Agency: Advent Associates, Inc.
- **Michigan Magnetics, Inc.** . . . 137
  - Agency: Stevens, Incorporated
- **Miller Co., J. W.** . . . 74
  - Agency: Balsam Advertising, Inc.
- **Mosley Electronics, Inc.** . . . 70
  - Agency: H. George Bloch, Inc.
- **Moss Electronic, Inc.** . . . 59
  - Agency: Bass and Co.
- **Motorola Inc., Parts & Accessories** . . 77
  - Agency: Leo Burnett Co., Inc.
- **Mueller Electric Co.** . . . 76
  - Agency: PDA Advertising Agency

- **Olson Radio Corp.** . . . 73
  - Agency: Wilson & Wagoner Adv Agency
- **ORRadio Industries** . . . 141
  - Agency: Sam Groden, Inc.
- **Oxford Components, Inc.** . . . 145
  - Agency: Sander Rodkin Adv Agency, Inc.

- **Paco Electronics Co.** . . . 140
  - Agency: Sam Groden, Inc.
- **Planet Sales Corp.** . . . 78
  - Agency: Gordon A. Pihl & Assoc.
- **Precision Apparatus Co., Inc.** . . . 81
  - Agency: Sam Groden, Inc.
- **Pyramid Electric Co.** . . . 67
  - Agency: Burton Browne Advertising

- **Quam-Nichols Co.** . . . 138
  - Agency: Stral Advertising Co.

- **Radiart Corp.** . . . 16
  - Agency: Friend-Reiss Advertising, Inc.
- **Radio Corp. of America** 32, 66, Cover IV
  - Agency: Al Paul Lefton Co.
- **Raytheon Co.** . . . 11
  - Agency: Fuller & Smith & Ross, Inc.

- **R-Columbia Product Co., Inc.** . . . 72
  - Agency: Burton Browne Advertising
- **Rek-O-Kut Co.** . . . 86
  - Agency: The Wexton Co., Inc.
- **Rider Publisher, Inc., John F.** . . . 65
  - Agency: Jack Gilbert Assoc.
- **Rye Sound Corp.** . . . 142
  - Agency: Jack Gilbert Assoc.

- **Sangamo Electric Co.** . . . 13
  - Agency: Arthur R. Mogge, Inc.
- **Scott, Inc., H. H.** . . . 146
  - Agency: Arnold & Co., Inc.
- **Sencore—Service Instruments Corp.** 23, 25, 27, 29
  - Agency: R. N. Johnson Advertising
- **Sherwood Electronic Laboratories, Inc.** . . . 136
  - Agency: Burton Browne Advertising
- **Shure Brothers, Inc.** . . . 148
  - Agency: William Hart Adler, Inc.
- **Simpson Electric Co.** . . . 55
  - Agency: The Fensholt Advertising Agcy, Inc.
- **Sonotone Corp.** . . . 133
  - Agency: Doherty, Clifford, Steers & Shenfield, Inc.
- **South River Metal Products Co., Inc.** 74
  - Agency: South River Advertising & Printing
- **Sprague Products Co.** . . . 22
  - Agency: The Harry P. Bridge Company
- **Stromberg-Carlson Company** . . . 134
  - Agency: The Rumrill Company, Inc.
- **Sylvania Div., General Telephone & Electronics** . . . 56, 57
  - Agency: J. Walter Thompson Co.

- **Tarzian, Inc., Sarkes** . . . 79
  - Agency: Argyle Wampler Advertising
- **Technical Appliance Corp.** . . . 75
  - Agency: Lescarboura Advertising, Inc.
- **Tenna Manufacturing Co.** . . . 10
  - Agency: Lehman Wood Advertising
- **TungSol Electric Inc.** . . . 28
  - Agency: E. M. Freystadt Assoc., Inc.

- **University Loudspeakers, Inc.** . . . 114
  - Agency: Promotion Affiliates
- **Utah Radio & Electronic Corp.** . . . 99
  - Agency: Wright, Campbell & Suitt, Inc.

- **Vaco Products Co.** . . . 80
  - Agency: O'Grady-Andersen-Gray, Inc.
- **V-M Corporation** . . . 88, 89
  - Agency: Mayer-Klann-Linabury Advertising, Inc.

- **Walsco Electronics Mfg. Co.** . . . 26
  - Agency: Paul J. Steffen Co.
- **Weller Electric Corp.** . . . 12
  - Agency: Arndt, Preston, Chapin, Lamb & Keen, Inc.
- **Wen Products, Inc.** . . . 64
  - Agency: Burton Browne Advertising
- **Winegard Co.** . . . 18, 19
  - Agency: Gourfain-Loeff, Inc.
- **Winston Electronics** . . . 71
  - Agency: Steiner and Wall Advertising, Inc.
- **Workman TV Products, Inc.** . . . 73
  - Agency: Russell Kolburne, Inc.

- **Xcelite, Inc.** . . . 75
  - Agency: Howard W. Nareau, Advertising

- **Zenith Radio Corp.** . . . 52, 53
  - Agency: Foote, Cone & Belding

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STEREO 1960

CONTENTS

Entire STEREO 1960 Contents on Pages 85-148

FEATURES and ARTICLES

Stereo Discs—A Critical Appraisal 91
Stereo Discs—The Technical Story 92
Speaker Systems for Stereo 94
Stereo Changers & Turntables 96
Stereo Cartridges—A Year Later 98
Analyzing the Stereo Cartridge 100
Styli for Stereo 102
Stereo Tape & Tape Recorders 104
The Stereo Installation—Pitfalls and Precautions 106
Conversions to Stereo 108
Report on Stereo Broadcast 110

PRODUCT CATALOG

Amplifiers & Preamps 115
Arms 119
Cartridges 120
Changers 122
Conversion Kits, Controls & Adapters 123
Microphones 124
Speakers & Enclosures 124
Tape Recorders 127
Tuners 128
Turntables 130

BUYERS DIRECTORY

Amplifiers & Control Units 131
Cartridges, Stereo Phono 131
Changers, Turntables & Arms 131
Conversion Kits & Adapters 132
Microphones 133
Needles, Stereo 133
Speakers & Cabinets 133
Tape 135
Tape Recorders, Playbacks & Accessories 135
Tuners AM and/or FM (includes receivers) 136
Alphabetical List of Manufacturers 136
Technical Societies & Industry Associations 138

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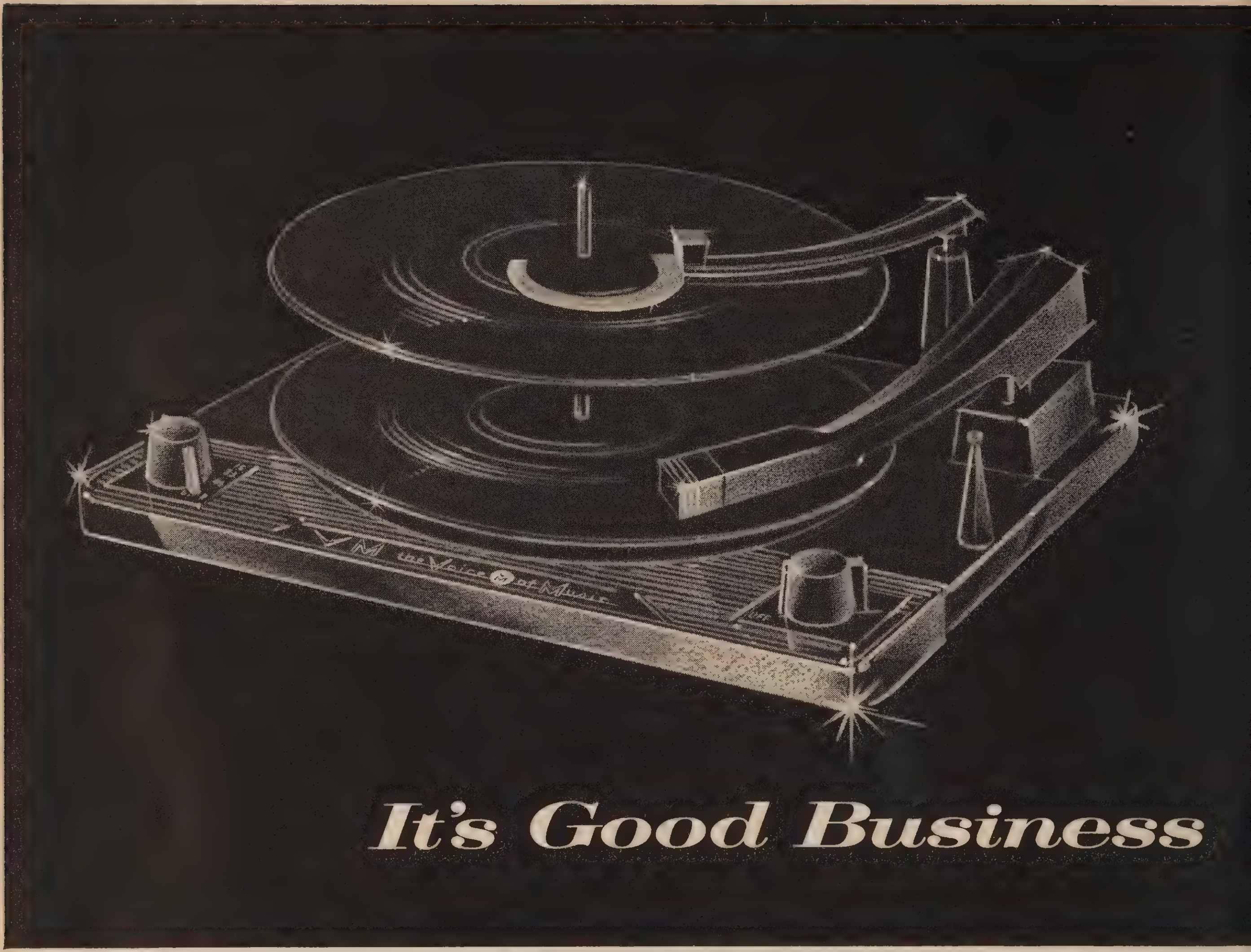
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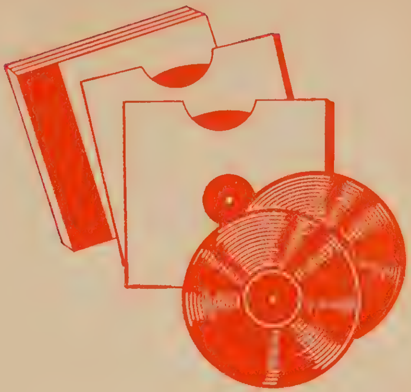
Stereo Discs—
A Critical Appraisal



Stereo Disc Shortcomings And Potential Are Revealed After A Full Year's Use

• One year ago, the stereo disc had just arrived. It was new. Everyone wanted to know if it really worked. How can you get two channels into one groove? Many record companies explained the operation in one form or another. Having satisfied ourselves that it was at least *possible*, we hurriedly listened to the stereo records at a Hi-Fi Show in an effort to appraise the actual performance.

This is where the disagreements first began-and still haven't ended. The demonstration discs were awe-inspiring; you could have ping-pong games, jet aircraft, railroad trains, even a rocket taking off at Cape Canaveral, all brought into the living room. Yet, an occasional murmur was heard inquiring, "What happened to the music?"

One demonstration, however, did play music with a "minimum of dramatic affects. It sounded ordinary. Finally, the same selection was played in its monophonic edition. After first hearing the stereo version, the consensus of opinion was that, although the stereo seemed quite ordinary, the mono following it sounded relatively lifeless.

Of course, the monophonic presentation still used the stereo equipment and in effect indicated compatibility of equipment, rather than a true comparison of mono versus stereo discs. This was really not comparable to playing mono discs on mono equipment and the same selection in stereo on stereo equipment.

Stereo Criticism

The main criticism of stereo is that it produces a dramatic effect at the expense of quality. This complaint is justified in some instances. However, record manufacturers have been showing a strong tendency to shy away from the "ping-pong" type of reproduction in favor of "naturalness." The transition period from exaggeration to realism in stereo recording techniques is being accomplished in a surprisingly short period of time.

Exaggerated stereo was purposely introduced as such to emphasize the difference between mono and stereo records. A few early attempts at realistic stereo recordings were criticized with, "I can't hear the difference between mono and stereo, so why stereo?" These same people, who only appreciated stereo if sound placement was grossly exaggerated, shortly refined their tastes and objected to this unnatural, though striking technique.

The record manufacturers, sensing this change, began directing their recordings to this new audience. However, the necessity of establishing a startling difference between the two modes of recording at-the-onset should not be ignored. If this difference was not presented in a manner that clearly identified it as something new and potentially better, the momentum generated from the early introductions of stereo would not have carried it to its present degree of perfection. Suffice it to say, that at the first public showing of stereo records and equipment, a sure way to "hold the audience" was to continuously play a ping-pong or railroad type of record. Just plain stereo music emptied a display room faster than an outbreak of fire. But now that one year has elapsed since the introduction of stereo, the novelty of this burlesque illusion should be displaced by stereo recordings that represent its true potential—dynamic reproduction with a true sense of instrument placement.

Remembering the early LP's of approximately ten years ago, we recall the denouncements of retrogres-

(Continued on page 146)

Background in Brief

The recent introduction of stereo discs belies its true age. As far back as 1931 a British patent was issued for a single groove stereo disc similar to the present 45/45 method. Actual production of a stereo disc was made in 1952 by Emory Cook. The Cook stereo disc used two separate monophonic grooves, one each for the right and left channels. It had the advantage of utilizing the advanced design of monophonic equipment; however, it introduced the physical problem of maintaining two separate cartridges in their respective grooves and therefore did not receive mass acceptance. Various single groove recording and playback methods were introduced at later dates, including the vertical-lateral, Minter, modified 45/45 and 45/45 systems. The RIAA, considering the various proposals, subsequently chose the 45/45 method as the standardized stereo recording and playback disc.

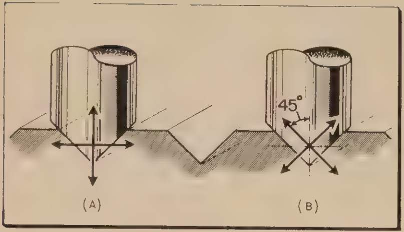


Fig. 1—An early proposed single groove stereo system, shown in A, had a vertical and horizontal axis. The 45/45 Westrex, in B, was chosen by the RIAA as the standard stereo disc system. It maintains the same relative position between the two axes in A, but both are rotated 45°.

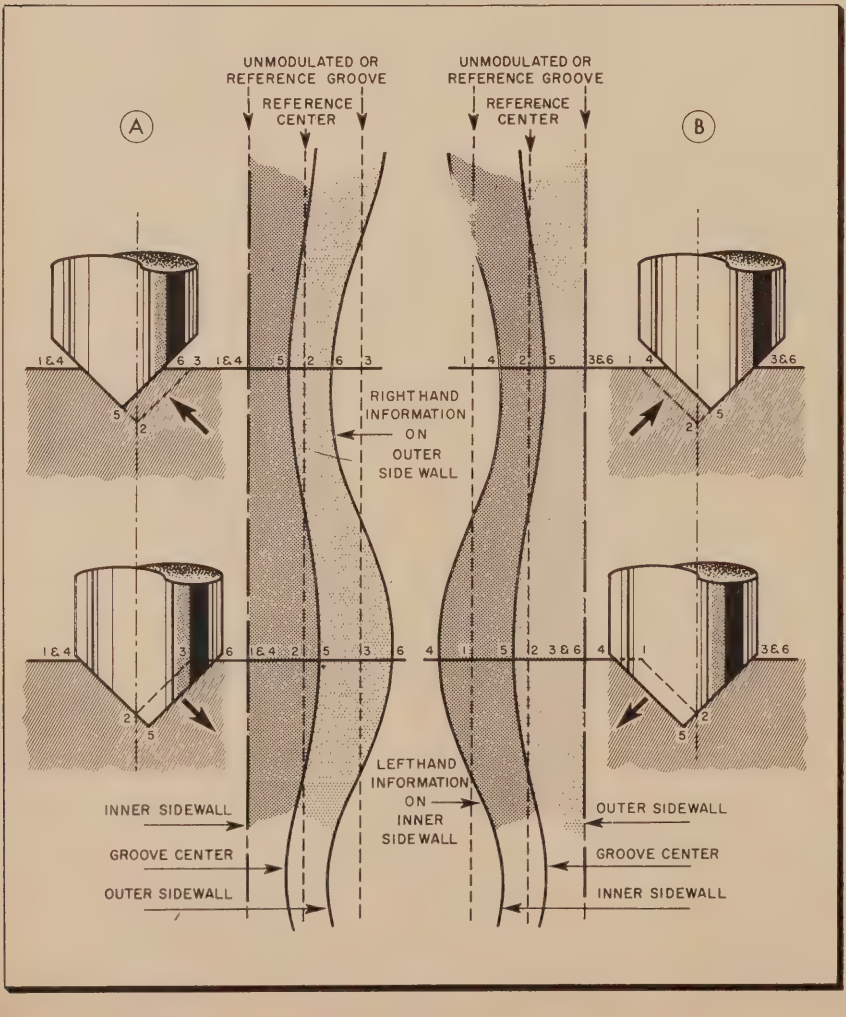
Stereo Discs—The Technical Story

The How And Why Of Two Channels In One Groove

• Although a number of single groove stereo disc methods were proposed, the RIAA singled out the Westrex 45/45 system as the standard for the record industry. Controversy still exists regarding the adaption of this system over other systems that have definite attributes. However, by reason of the Westrex system being approved by the RIAA, other systems, though having considerable merit, will not be discussed since they can be viewed only from an historical or theoretical viewpoint.

While the monophonic LP operates on the principle of lateral movement, the Westrex 45/45 system uses the principle of diagonal movement, i.e., both a lateral and a vertical movement with a 90° relationship to each other, with the vertical and horizontal axis rotated 45° as shown in Fig. 1.

Fig. 2—A. Right channel modulates outer side wall. Stylus travels up to the left and down to the right. B. Left channel modulates inner side wall. Stylus travels up to the right and down to the left. Groove center is always midway between both side walls.


UNMODULATED OR REFERENCE GROOVE
REFERENCE CENTER
A
UNMODULATED OR REFERENCE GROOVE
REFERENCE CENTER
B
1&4
6 3 1&4
5 2 6 3
1 4 2 5
3&6 1 4
3&6
5
2
RIGHT HAND INFORMATION ON OUTER SIDE WALL
2
5
1&4
3 6 1&4 2 5 3 6
4 1 5 2 3&6 4
1
3&6
2
5
2
5
LEFT HAND INFORMATION ON INNER SIDE WALL
INNER SIDEWALL
GROOVE CENTER
OUTER SIDEWALL
OUTER SIDEWALL
GROOVE CENTER
INNER SIDEWALL

45/45 System

In this system, the right hand channel alone modulates the outer side wall of the groove. Accordingly, the stylus must travel diagonally up to the left and down to the right as shown in Fig. 2A. The left hand channel alone, shown in Fig. 2B, modulates the inner side wall, and therefore the stylus must travel diagonally up to the right and down to the left.

In an effort to simplify the drawings and text, the unmodulated groove is presented as a straight line. Actually, the unmodulated groove is slightly curved to follow the contour of a round record. The basic concept, however, is not changed.

As the stylus rides up and down, the groove becomes narrower and wider respectively. When the stylus moves back and forth, the center line of the modulated groove moves accordingly. It should be kept in mind that the stylus point is always in the groove center and contacting both sidewalls. *Two channels are recorded at the same time; not a left and a right separately.*

The stylus cannot trace out a corkscrew motion. All motion is confined to the vertical plane. Relative motion between the groove and stylus or cutter—if projected in a drawing—may appear to have a corkscrew motion, although this is not actually

THE STEREO RECORD

- *Westrex 45/45*
- *Diagonal Motion*
  - Horizontal Components
  - Vertical Components
- *Movement Indicators*
  - Groove Width
    - Vertical Displacement
  - Groove Center
    - Lateral Displacement

true. The stylus is in one position only at any given instant. This position "defines" both walls.

What happens when both channels are differently modulated at the same time? Fig. 3 illustrates how the stylus motion and relative groove width, at any given instant, correspond to the application of different forces. When both channel walls push up at the same time, with the same force, the stylus will travel straight up. Conversely, the stylus will travel straight down when both channel walls apply the same downward force at the same instant.

When the grooves are narrow, the stylus tip is "pinched" and thereby raised vertically. As the grooves expand, the stylus tip is lowered. See Fig. 4. An out-of-phase force,—that is, one channel pushing up while the other one pushes down—will cause the stylus to travel laterally to one side or to the other, depending on the direction of the resultant force. Thus, the stylus can travel in any direction depending upon the forces exerted on it. It can then be seen that although the information is cut into the groove at a 45° angle, the stylus is displaced either horizontally, vertically, or both, from the reference groove at any given instant.

Complex Grooves

The most difficult part of understanding the operation of a stereo disc occurs when a stylus must track a groove that has one sidewall very much different than the other. The first and probably most important hurdle to overcome is the erroneous

(Continued on page 145)

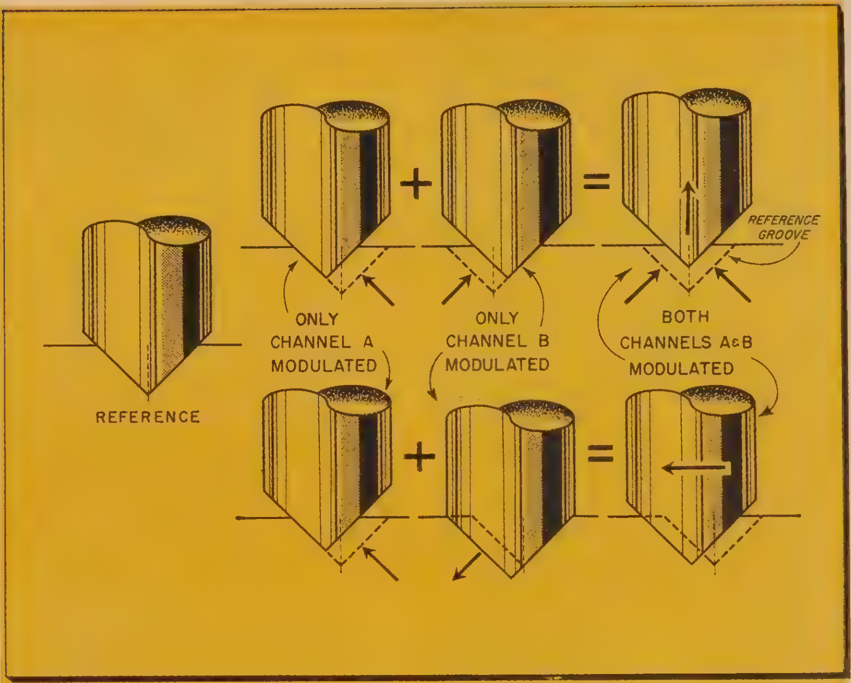

REFERENCE
ONLY CHANNEL A MODULATED
ONLY CHANNEL B MODULATED
BOTH CHANNELS A&B MODULATED
REFERENCE GROOVE
+
=
+
=

Fig. 3—Stylus may move up, down, right or left, depending on information impressed on sidewalls. Sidewalls are modulated by the net result of each channel's signals.

Fig. 4—Pinching and expanding grooves cause stylus to fall and rise. Straight center line indicates no lateral motion; a curved line shows motion. Unvarying reference groove width doesn't produce vertical displacement of the stylus.

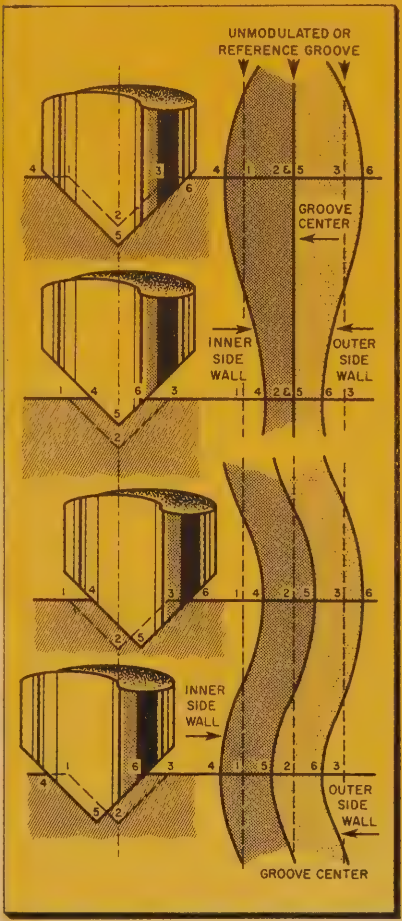
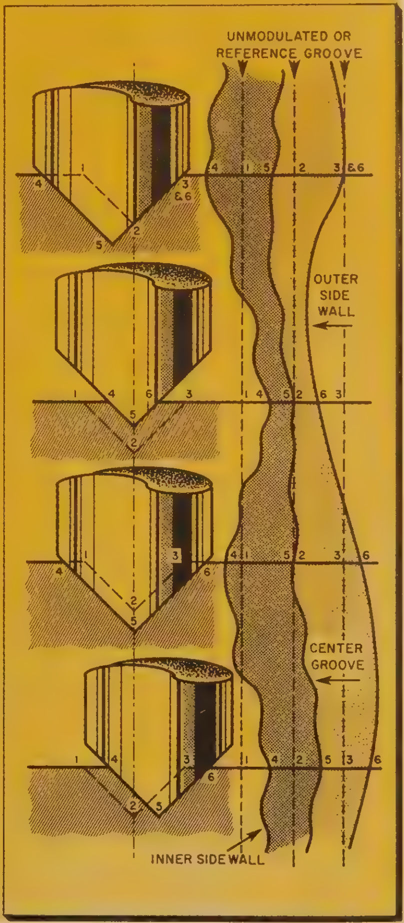
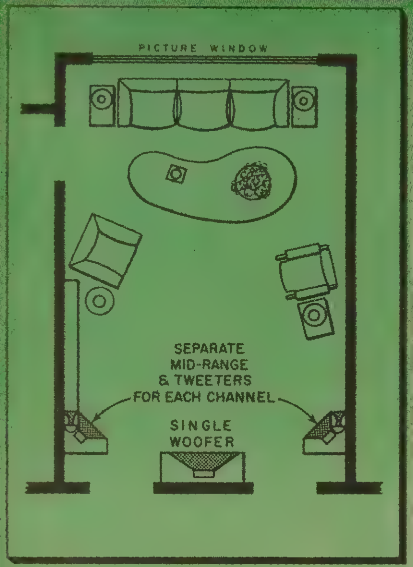

UNMODULATED OR REFERENCE GROOVE
GROOVE CENTER
INNER SIDE WALL
OUTER SIDE WALL
INNER SIDE WALL
OUTER SIDE WALL
GROOVE CENTER
1
2
3
4
5
6
2 & 5

Fig. 5—Combination of lateral and vertical displacement at the same time, with varying conditions from one instant to the ~~next, cut~~ a groove that seemingly cannot be tracked. It can—see text!


UNMODULATED OR REFERENCE GROOVE
OUTER SIDE WALL
CENTER GROOVE
INNER SIDE WALL
1
2
3
4
5
6
3 & 6

Speaker Systems

Bookshelf, Satellite And Reflector Door



A very large room using widely spaced speakers may require a third speaker to avoid a "hole in the middle" effect.

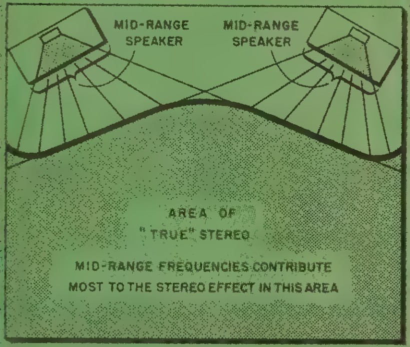
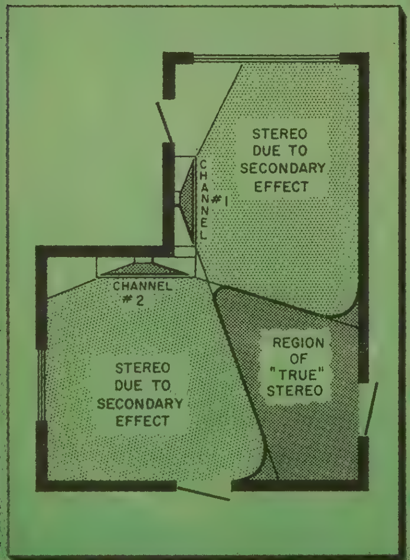

MID-RANGE SPEAKER
MID-RANGE SPEAKER
AREA OF "TRUE" STEREO
MID-RANGE FREQUENCIES CONTRIBUTE MOST TO THE STEREO EFFECT IN THIS AREA

Fig. 1—This basic speaker placement approach provides a wide stereo listening area in large rooms. Placing speakers parallel to the listener would necessitate closer spacing to achieve the proper effect.

Fig. 2—The problems of "L" shaped rooms can be considerably overcome by using two wide-range multiple speaker systems to take advantage of secondary bounce effect.


STEREO DUE TO SECONDARY EFFECT
CHANNEL #1
CHANNEL #2
REGION OF "TRUE" STEREO
STEREO DUE TO SECONDARY EFFECT

• One of the most essential factors in obtaining successful stereo is to have the right speaker for a particular listening room. There are several ways to achieve this objective, among them, a basic approach shown in Fig. 1. An unusual approach that takes advantage of a secondary bounce effect is shown in Fig. 2.

A number of other systems have been developed by manufacturers during the past year. Also, a great variety of small speaker systems have appeared, which make the choice for small rooms much easier.

"Satellite" Systems

A feature of all "satellite" systems is the "piping" of all the bass into one speaker. One or two small speaker units, strategically placed, handle the higher frequencies. Experimentation has shown that bass frequencies below 250 cps do not contribute much towards the stereo effect. However, sounds below 250 cps do exhibit a directional sense due to harmonics.

Some of the systems, using one "satellite" as shown in Fig. 3, do a good job where space suits the arrangement. An example of a system designed for two "satellites" is shown in Fig. 4.

Besides using the "big" speaker only for bass frequencies, other systems use it for center fill over the mid-range and high frequencies by taking a mix from each channel. Many believe that this aids immeasurably in eliminating the hole in the middle problem. A convenient method to establish a third channel is shown in Fig. 5.

Directivity

An important factor, related to the acoustic characteristics of the listening room, is the degree of speaker directivity. This encompasses the extent of beaming or diffusion of sound at different frequencies. Of course, no speaker is either completely directional or non-directional, but some systems lean more towards one extreme than the other.

Some manufacturers offer directional versatility by allowing a mid-range speaker or speakers to be rotated on its mounting so that the sound emanating from it can be directed to the desired area. Another system promotes diffusion of sound through use of open enclosure backs, giving a bi-phase radiation that reportedly creates a stereo illusion in the vicinity of each listener's head and enlarges the listening area as illustrated in Fig. 6.

Other companies, recognizing the varied directional needs because of vast differences of listening areas, include movable speaker enclosure doors, illustrated in Fig. 7, that accomplish diffusion of sound by a bounce effect from the room walls. The position of the doors varies the sound pattern of each channel. One company, using this technique, claims improved deflection results by beaming the speakers to each side of the enclosure, thereby producing a primary bounce effect and preventing the higher frequency sounds from being beamed directly to the listener. The stereo sound seems to come from a source behind the walls.

In general, the livelier the room, that is, the less acoustic absorption material such as drapes, rugs, etc., the more diffusion is needed to create the illusion of depth and breadth. Well damped rooms, with wall-to-wall carpet, heavy furnishings, etc., can use some directionality so that the true stereo effect may be realized.

Bookshelf Speakers

Bookshelf speakers are being offered in many varieties. One thing

For Stereo

Units Cater To The Listening Environment

they all have in common is small size. While some units are single speaker affairs, others are complete small systems. Many offer excellent sound (a number do not) and some even provide clean, thumping bass frequencies, although at a sacrifice in speaker efficiency. New speaker designs such as the acoustic suspension development, high compliance cones, improved voice coils and enclosure damping methods allow many small units to surpass the "behemoths" of yesteryear.

Speaker Matching

Speakers should be fairly well matched in frequency response to prevent reproduced sounds from "moving" about. This may be fine for strolling violins, but normally proves disconcerting with the usual recorded material. Some experts maintain that the speakers for each channel should be matched in frequency response and coloration as closely as possible. This will prevent instruments from "floating" around the room. Others say that a slight mismatch—not in impedance, but in character of reproduction—enhances the stereo effect and in fact, discernibly improves monophonic reproduction since the slight, almost unrealized movement, results in a pseudo stereo effect. Whichever your "pot of tea," the mismatch should not be so noticeable as to produce an unnatural illusion to the ears.

Unfortunately, speakers are semi-intangible components, that cannot be "measured" and judged by cold specifications alone. Individual preferences are of the utmost importance. Some like 'em brilliant, others subdued. The technician is in an ideal position to sell speakers, since he is familiar with the customers homes and their listening preferences. The customer needs expert advice and is more likely to get it from an expert that knows his home and habits. •

Fig. 3—The single "satellite-type" speaker carries the frequencies above 300 cps from one channel. The larger speaker carries bass frequencies of both channels plus all other frequencies of one channel.

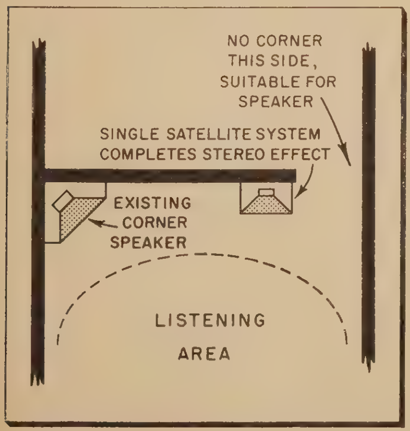
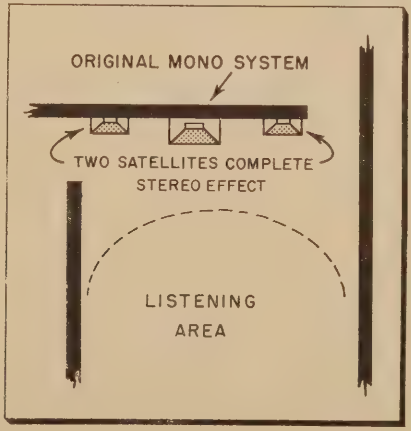

NO CORNER
THIS SIDE,
SUITABLE FOR
SPEAKER
SINGLE SATELLITE SYSTEM
COMPLETES STEREO EFFECT
EXISTING
CORNER
SPEAKER
LISTENING
AREA

Fig. 4—An original monophonic speaker system is converted for stereo use by adding two satellite speakers. The center speaker carries bass frequencies of both channels.


ORIGINAL MONO SYSTEM
TWO SATELLITES COMPLETE
STEREO EFFECT
LISTENING
AREA

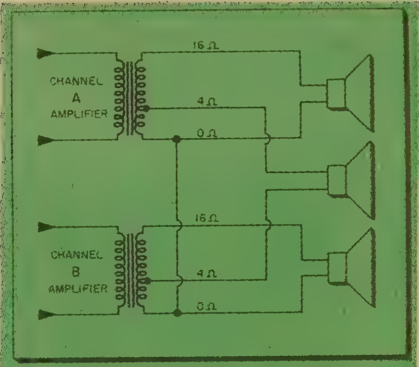

CHANNEL
A
AMPLIFIER
16 Ω
4 Ω
0 Ω
CHANNEL
B
AMPLIFIER
16 Ω
4 Ω
0 Ω

Fig. 5—Establishing a third channel. While this doesn't add anything to bass response, it does improve directional sense with respect to the center of the program source.

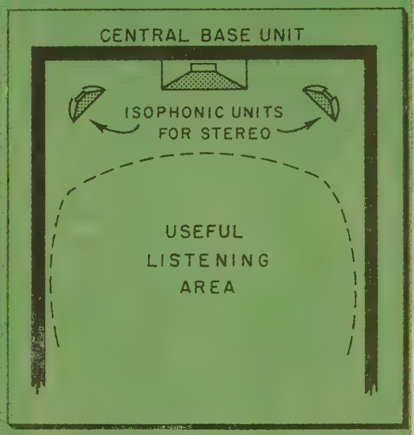
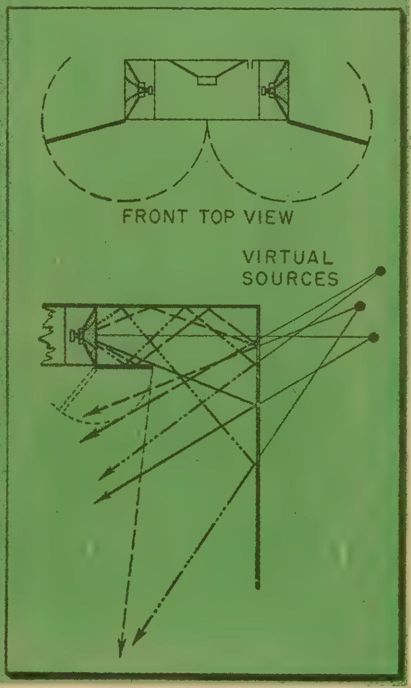

CENTRAL BASE UNIT
ISOPHONIC UNITS
FOR STEREO
USEFUL
LISTENING
AREA

Fig. 6—System shown takes advantage of open-back satellite-type speaker enclosures to provide increased sound dispersion.

Fig. 7—The position of enclosure doors may be varied to affect the sound pattern of each channel. The sound acts as if it comes from virtual image sources behind the wall as a result of a bounce effect.


FRONT TOP VIEW
VIRTUAL
SOURCES

Stereo Changers & Turntables

Industry Changes Keep Up With Stereo

• The growing popularity of stereo records has been paralleled by the rise of manual operated record changers, manual record players and single speed turntables.

LP records brought the single play record operation to the attention of the consumers generally. Retailers and publications have also been instrumental in forming public opinion concerning certain advantages of using a single record play device. Although the controversy—record changer versus turntable—still exists, and is really a matter of personal inclination, the longer playing time of LP's and lighter tracking force required for stereo has sparked several improvements.

Types

Most record changers now offer the user a choice of automatic disc changing and manual playing by including a manual mechanical switch. As a result, many people feel they can "have their cake and eat it too." However, the persons wishing optimum performance and/or prestige, have not been neglected either. Numerous companies include a manual player and turntable in their line.

Manual players can be manual copies of the company's existing record changer; but without the changing mechanism. Others use the basic motor-drive system of their record changer with a larger, heavier turntable minus the standard tonearm. In the tonearm's place is either a separate professional-type tonearm or provision for attachment of one. No one will argue, of course, the lighter tracking weight possibilities of a separate quality tonearm.

Another trend that has appeared since stereo made its debut, is the single speed, usually belt driven turntable, with or without an integrated cartridge/tonearm assembly. The single speed eliminates the speed change mechanism, resulting in a lower relative selling price.

Semi-professional or professional turntables are appealing to many persons. The lower rumble content and evident quality are naturally the enticing factors in this choice. However, the costs are necessarily higher.

Rumble

Since the vertical rumble component is picked up by stereo cartridges, manufacturers have provided better motor isolation in their units to lower the transmission of it through the pickup. In addition to a vertical rumble component, stereo records are recorded at about 3 db lower per channel than a comparable monophonic record. This was done to avoid a wider record groove. Accordingly, rumble and noise content becomes more noticeable and some pre-stereo changers and turntables may not be quite good enough for stereo.

Arm Pivots

Arm design, whether for record changer or turntable, has been affected by stereo. Smaller styli and corresponding lower tracking force has appreciably increased the need for less pivot friction on tonearms. Tracking complex stereo grooves horizontally and vertically requires minimum arm pivot friction in both directions in order to aid the cartridge's prompt response to the challenge of many up and down movements.

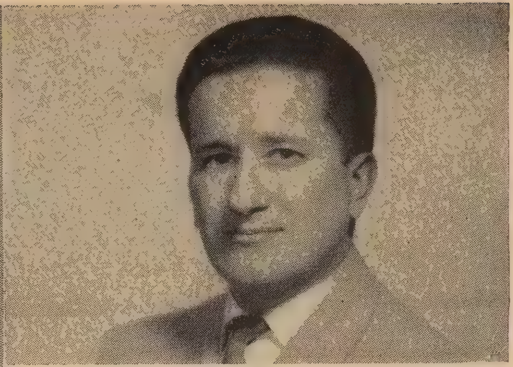
Other Developments

The past year has witnessed some "luxury" developments in the changer-turntable field, such as: Turntable/arm "floating isolation" from the unit's base, level bubble for leveling of the turntable, level devices to move the turntable plane up or down on all sides, variable speed adjustments, arm lowering device, stroboscope for ascertaining the speed of the unit, stylus cleaning brushes, etc. All these additions help make listening to records a more pleasurable affair. •

"Nothing Short of Superb,"
says Raymond E. Ward,
Distributor-Sales Mgr., Shure Brothers, Inc.

"That's our unanimous verdict on the results we have had with the Garrards used for laboratory testing of our new Stereo Dynetic Cartridges. Because we can rely on Garrard's precision construction and consistently accurate performance, we have been able to concentrate fully on developing the exceptional sound reproduction Garrard and Shure users expect...and get. Now, our sales records show that more of our new cartridges are being installed in Garrard Record Changers than in any other changer or turntable. This is only natural, because they work so well together."

SHURE
STEREO
Dynetic
Cartridge in
GARRARD SHELL

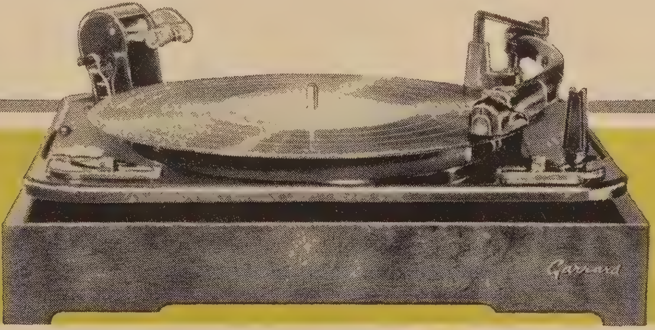


"Complaints from Garrard Users? Practically Zero!"
says Joseph Pickert,
Mgr., Service Dept., Shure Brothers, Inc.

"That's right! Garrard owners who install the new Shure Stereo Dynetic Cartridge get such perfect sound reproduction that we rarely get a complaint. The exact fit of the cartridge in the Garrard shell, the precision mounting of the tone arm, the controlled arm action and tracking at the lightest specified weight mean longer life for cartridge and records...along with the finest audio for stereo and monaural."

"Garrard changers are eminently superior with SHURE stereo cartridges"

What Mr. Ward and Mr. Pickert say about the Garrard Changer—for stereo—is typical of its universal acceptance by component manufacturers and high fidelity enthusiasts.
In fact, more Garrard *Changers* are sold today as components for stereo—than all other turntables and changers combined! That's why—before you buy—you should see and hear stereo records played on a Garrard Changer such as the incomparable RC88.



The same reasons why Garrard Changers perform so well with Shure Dynetic Stereo Cartridges account for Garrard's popularity with all other manufacturers of fine stereo cartridges—Electro-Voice, Fairchild, General Electric, Pickering, etc.

- Vibration-free turntable.
- Vertical and lateral rumble completely inaudible. Wow and flutter far below exacting "broadcast tolerance" standards.
- Exclusive Aluminum tone arm precision-mounted at engineering works for optimum tracking angle, perfect sound reproduction.
- Unrestricted choice of stereo cartridges—any of them will track at the manufacturer's lightest specified weight.
- Record handling gentler than the surest human hand.
- The important convenience of manual play plus completely automatic operation without compromise in performance.

These are the FACTS, no one can deny them with authority—and they are backed by the 36 years of experience that have created Garrard's unique reputation for unsurpassed quality.

For the best in Stereo...
Insist on a

Garrard
CHANGER

THE WORLD'S FINEST!

Send for free Garrard Comparator Guide.

Your Name ______________________

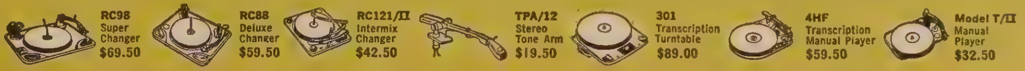
Address ______________________

City ______________ *State* ________

Mail to Dept. GM-559 at address below.

There's a Garrard for every high fidelity system...all engineered and wired for Stereo and Monaural records.

B.I.C. ENDORSED QUALITY



RC98	Super Changer	**$69.50**
RC88	Deluxe Changer	**$59.50**
RC121/II	Intermix Changer	**$42.50**
TPA/12	Stereo Tone Arm	**$19.50**
301	Transcription Turntable	**$89.00**
4HF	Transcription Manual Player	**$59.50**
Model T/II	Manual Player	**$32.50**

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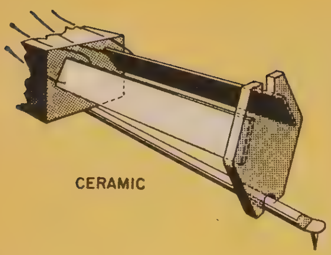
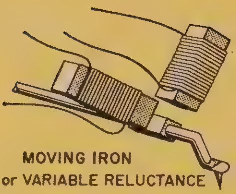
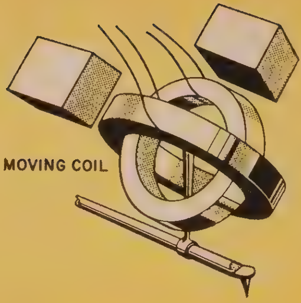
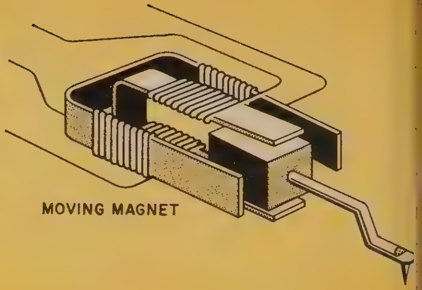

CERAMIC


MOVING IRON
or VARIABLE RELUCTANCE


MOVING COIL


MOVING MAGNET

Stereo Cartridges—A Year Later

Stereo Revises Basic Cartridge Design Concepts

The competition between magnetic and ceramic cartridges has increased since the introduction of stereo. Ceramic cartridges are used in the majority of package phonograph units. Contributing factors are improved performance, lower cost and less expensive amplifier requirements. Magnetic types though, have acquired many devotees thanks to the more refined performance of certain units. Many magnetic cartridge manufacturers are presenting new integrated cartridge-arm assemblies.

• In the cartridge industry, a year with stereo has seen the continuance of some trends evident even before stereo arrived. One trend is toward more integrated arm design, rather than the "interchangeability" approach in vogue for a decade or more.

Maximum flexibility for intermixing any cartridge with any arm was once regarded as the ideal assembly. However, it became apparent to many that this interchangeability requirement was really a limitation to the audiophile wishing the highest degree of fidelity. The stylus compliance affects the magnitude and frequency of arm resonance, and the dynamics of the arm is reflected in the pickup response. Accordingly, a number of engineers believe the best method to obtain the "ultimate" in performance, including flattest response and lightest acceptable tracking pressure, is to design a cartridge and an arm that will complement each other.

The advocates of interchangeable cartridges and arms maintain that the advantage gained by integrated design is offset by the disadvantage of not being able to take advantage of another cartridge manufacturer's cartridge and arm improvements without discarding the entire unit. Certainly, many interchangeable units have provided excellent reproduction.

For some time, consumer preferences for different pickups followed certain general patterns. For example, the devout fidelity group might admire the moving coil cartridges; budget minded audiophiles might consider the variable reluctance cartridges supreme. Packaged phonograph manufacturers were partial to crystal cartridges because they were inexpensive and did not require preamplification or equalization.

The audiophile did not accept the crystal pickup as a high fidelity component, and with justifiable reason. Its lack of stability, susceptibility to moisture and stylus stiffness were sound observations.

Ceramic cartridges gradually replaced crystals; employing the same piezo-electric principle. The ceramic, however, can be manufactured under closer control and is impervious to moisture. Consequently, its stability and greater compliance have made ceramic cartridges a firm entrant in the high fidelity field. Its high output, of course, is still appreciated by package manufacturers. Just as important, audiophiles are accepting the units as high fidelity components, and the majority of amplifier-preamplifier producers incorporate a ceramic input in their equipment. Also, at least one type ceramic cartridge has a magnetic adapter for use in magnetic inputs.

Just before stereo arrived, a new type of cartridge was introduced to compete with the moving iron and moving coil types; the moving magnet. This type was quickly accepted by experts as a high quality cartridge.

Between the upgrading of piezos by the ceramic, and the introduction of the new moving magnet types, the established pattern of more than a decade was being seriously challenged. Then came stereo!

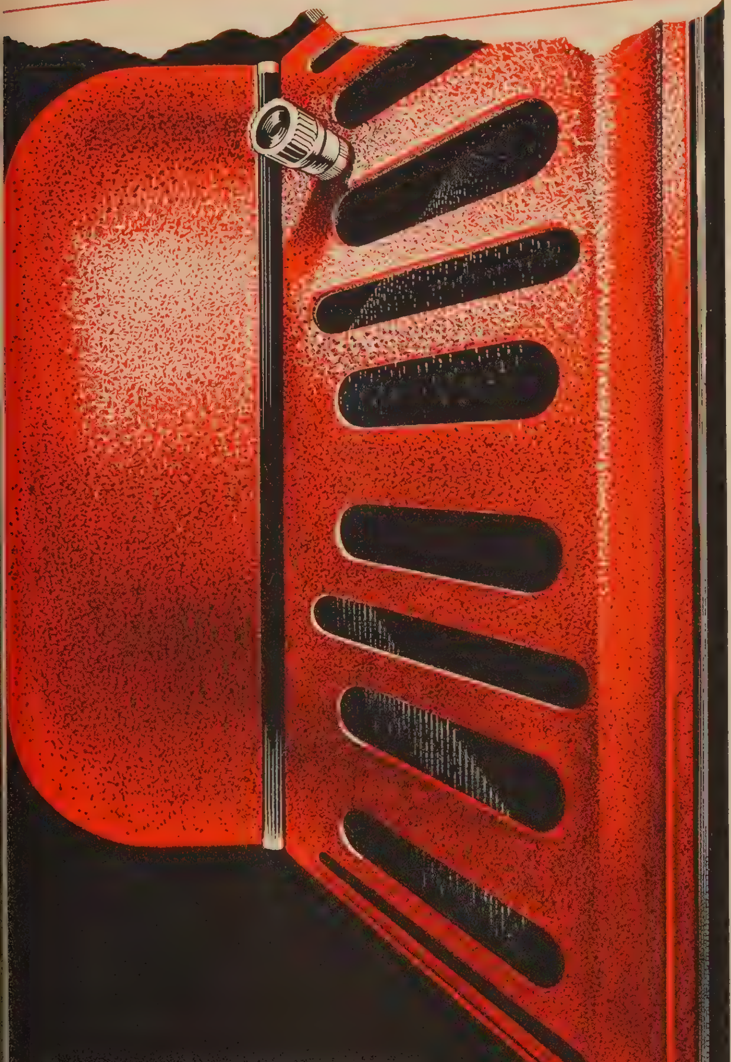
For years cartridge styli had been concerned with moving laterally or horizontally. Cartridge designers were competing with each other to limit vertical motion, as this movement did not produce any output.

Stereo reverses this concept. Vertical movement must be as free as horizontal movement. In addition, the stylus directions under consideration are two angles at 45° resulting in 90° angles in relation to each other. Each 45° movement can therefore, be regarded as "half vertical and half horizontal." Therefore, design parameters and concepts had to be drastically revised to provide freedom of vertical movement.

It was only natural then, that early stereo cartridges did not produce optimum performing cartridges. This

(Continued on page 144)

You asked for more!
Since introduction of the
Duals, demand has been
so great we've extended these
famous speakers into 6" x 9"
and 15" sizes as well as
the 8's and 12's!



* These new Utah speakers were inspired by the fabulous new Boeing 707 Jet Airliner, now streaking coast to coast in just 4½ hours! Utah speakers, *too*, pack more power per pound, feature Jet Airliner slim-line design to meet modern demands for more compact Stereo and High Fidelity applications.

MORE POWER PER POUND

in the ALL-NEW UTAH*

dual-diameter speakers

. . . Never before such *concentrated power!* The secret is in Utah's brand new dual-diameter magnetic circuitry and dynamic Uni-coils. By ingeniously combining two magnetic material structures into one, Utah has produced the greatest power per pound in a loud-speaker since the advent of Alnico V. See the all new Utah speakers now — 8" full range model **D8LA** and 12" full range model **D12LA** — they're as "hot" as a Jet Airliner!

utah
SPEAKERS

Utah Radio & Electronic Corp., Huntington, Ind.

Analyzing The Stereo Cartridge

Mechanical Forces Provide Foundation For Single Stylus Stereo Cartridge Operation

• One of the byproducts of stereophonic theory, the stereo cartridge, forced cartridge manufacturers to reassess the substantial monophonic design advances they had made through the years. New parameters appeared such as channel separation, equal output and frequency response of each channel and freedom of vertical movement—resulting in vertical rumble susceptibility.

Except for the addition of some terminals, the outward appearance of the stereo cartridge is conventional. Internally, almost all stereo cartridges have added another element. (Single element stereo cartridges, however, are also on the market.) The two elements are arranged at a 90° angle from each other, but at a 45° angle from the vertical plane. The element types contained in the stereo cartridges are typically magnetic, moving coil, moving iron and ceramic.

The stereo cartridge, because of its greater vertical compliance, picks up more rumble than the monophonic cartridge. Many manufacturers alleviate this problem by using mechanical vertical-suppression devices or an electronic mixing method which may consist of bridging cartridge elements with a resistor. Others attenuate the cartridge output for the vertical low frequency component. Since low frequencies are essentially in the horizontal movement, the vertical component at low frequencies should not materially deteriorate the cartridge response.

Impedance matching requirements are basically the same as with monophonic cartridges. The manufacturer's specifications should be consulted for proper load requirements. Some ceramic cartridges employ an adapter to enable the high output cartridge to operate through the magnetic input. In any case, the load resistors provided in the preamplifier should match the required load for the cartridges.

STEREO CARTRIDGE

Velocity Sensitive
- Moving Coil
- Moving Iron
- Variable Reluctance

Amplitude Sensitive
- Ceramic

Terminals
- 3-Pin
- 4-Pin

Phasing
- Mechanical
- Electrical

Rumble Suppression
- Mechanical
- Electrical

Phasing

Phasing is important to achieve the proper stereo effect. The RIAA standard established that equal in-phase signals will result in lateral modulation of the record groove. Since mechanical in-phase signals will produce a vertical displacement, as shown in Fig. 1, the leads to one of the two cutter head's coils are reversed so that a lateral cut will be made. The playback cartridge terminals are, or should be, reversed in phase by the manufacturer to reproduce the original phasing. Therefore, the playback cartridge reproduces the mechanical in-phase signal with a horizontal motion rather than a vertical motion. See Fig. 2. This conforms with the RIAA requirement of

(Continued on page 140)

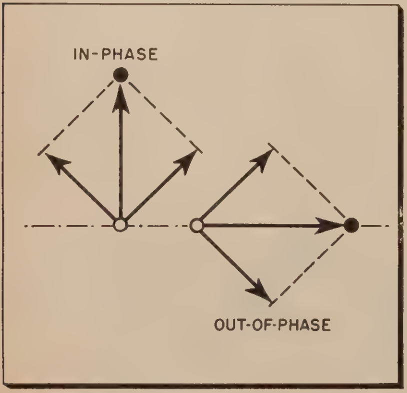


Fig. 1—The dawing at the left indicates vertical stylus displacement as a result of in-phase mechanical forces. Right hand drawing shows out-of-phase mechanical forces causing lateral stylus movement. In-phase and out-of-phase mechanical forces opposite to those shown can, of course, displace the stylus respectively vertical-down and horizontal-left.

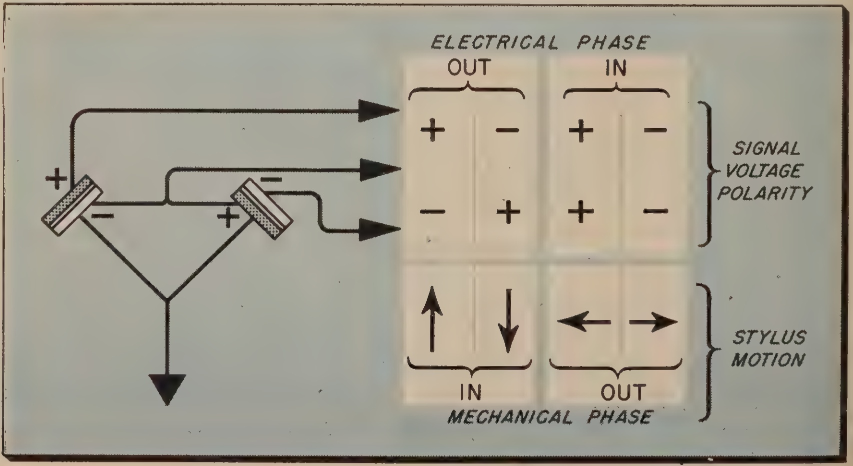


Fig. 2—In-phase mechanical forces result in out-of-phase electrical signals. Conversely, out-of-phase mechanical forces cause in-phase electrical signals. This conforms with the RIAA requirement of deriving an in-phase signal from a horizontal motion. Bass frequencies are essentially in-phase signals and therefore will be found mostly in the horizontal component of the disc.

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. . . world's largest cut diamond—ceaselessly reflects its 530 carat brilliance from Britain's Royal Scepter. Here truly is the unchallenged criterion of perfection in diamonds.

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DIAMOND STYLUS BY JENSEN

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7333 West Harrison Street, Forest Park, Illinois

Styli For Stereo

Vertical Output Of Cartridges Demands Styli Re-evaluation To Avoid Distortion And Tracking Problems

CHARACTERISTICS

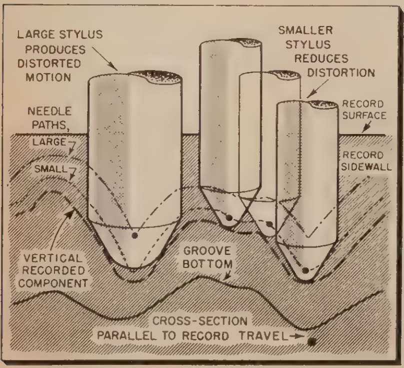
- *Electrical*
  - Distortion
    - IM
    - Harmonic
  - Crosstalk
- *Mechanical*
  - Excessive Wear
  - Tracking
  - Pinch Effect
  - Alignment
- *Physical*
  - Material
  - Size

• Many components develop defects that prove disturbing and frustrating to the user. The stylus, in addition to having this possibility, can quietly destroy precious records. This destructive potential is not remote, either. The stylus can easily become a record destroyer if worn, too large or small, applying improper pressure on the disc or misaligned. In view of these possibilities, particular attention should be given to this little workhorse.

Stylus Size

The 1 mil stylus, successfully used with monophonic discs, proved too large to trace complex stereo record grooves. The RIAA recommends a 0.5 mil stylus for best stereo reproduction. However, a 0.7 mil stylus is the currently popular radius size, chosen as a necessary compromise due to some unsurmountable problems at the present time.

Fig. 1—The path of the larger stylus differs from the actual vertical recording component resulting in distortion. A smaller stylus minimizes this distortion since it traces closer to the original recorded component.


LARGE STYLUS PRODUCES DISTORTED MOTION
SMALLER STYLUS REDUCES DISTORTION
NEEDLE PATHS,
LARGE
SMALL
RECORD SURFACE
RECORD SIDEWALL
VERTICAL RECORDED COMPONENT
GROOVE BOTTOM
CROSS-SECTION PARALLEL TO RECORD TRAVEL

Tracking Force

A major factor dictating the use of the 0.7 mil stylus rather than a 0.5 mil is the tracking force requirement. Reducing tip size without decreasing the stylus pressure will result in a radical increase of pressure applied to the record groove. For example, changing the tip radius from the standard 1 mil to 0.5 mil, without correspondingly lowering the tracking force, will multiply the stylus pressure on the record groove (already measured in tons per square inch) approximately four times. This, of course, would result in excessive wear of records. Decreasing the stylus pressure until the record wear is consistent with present standards may initially appear as the solution to this problem. However, another difficulty is introduced—tracking ability.

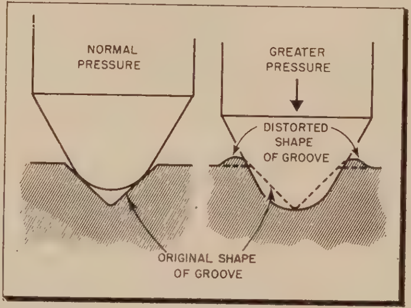


Fig. 2—A larger stylus is liable to bounce out of the groove because it is riding on the upper portion of the disc's sidewalls.

Employing a 0.5 mil stylus necessitates tracking pressure in the 2 gram range. In order to properly track stereo grooves, especially heavily modulated passages, the stylus must be extremely compliant to respond under light pressure, be supported in its efforts by a top-quality tone arm and accurately aligned to the turntable plane. Also, vibration effects in the home should be at minimum to prevent the stylus from jumping grooves while playing a record.

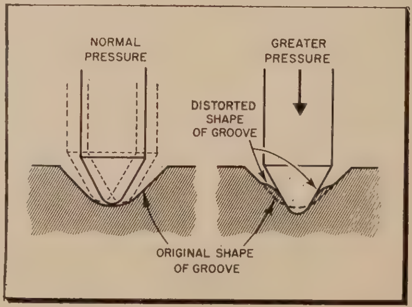
In view of these demands, it is not surprising that the 0.7 mil stylus is used by the majority of manufacturers. Some manufacturers, though, do use the 0.5 mil stylus with their integrated arm/cartridge designs. They take advantage of the complementary design of each component, i.e., stylus, cartridge and tone arm, to minimize all of the aforementioned difficulties. Dismissing the inflexibility of integrated units, an advantage of using the 0.5 mil stylus is lowered distortion. All factors being equal, the 0.5 stylus will produce less distortion than a 0.7 mil stylus. As shown in Fig. 1, a smaller stylus will trace with less deviation from the actual vertical cutting than a larger stylus. Thus, the smaller stylus will produce less 2nd harmonic distortion in the vertical component and less IM or difference frequencies.

Improper Size

It is unwise to purchase a pickup with one stylus and expect dual

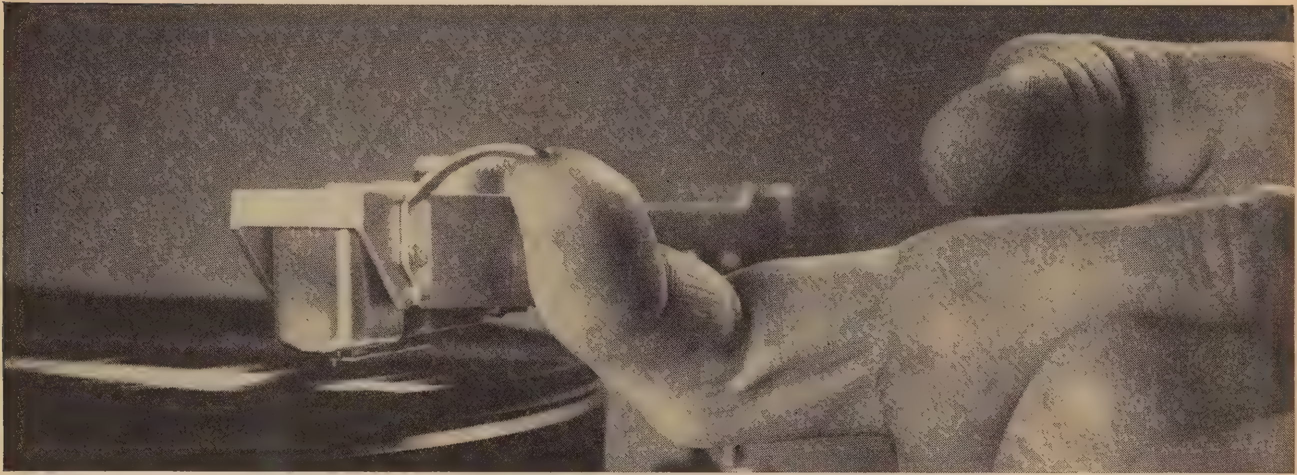
(Continued on page 142)

Fig. 3—A stylus that is too small will slide along the bottom of the groove in an erratic manner causing increased distortion and wear. Increased pressure may reduce erratic behavior, but will increase wear.



General Electric's all-new VR-22 Stereo Cartridge

Outstanding in all four critical areas....



A masterpiece of stereo cartridge design and manufacture, the VR-22 is outstanding in all four critical areas of stereo cartridge performance: *Channel separation*—Up to 28 db for maximum stereo effect. Nothing higher on the market! *Response* — Smooth and flat for superior sound from 20 to 20,000 cycles (VR-225), 20 to 15,000 cycles (VR-227). *Freedom from hum*—triple-shielded against stray currents. *Compliance*—Tracks precisely, not a trace of stiffness. Hear it at your dealer's soon.

VR-225 with .5 mil diamond stylus for professional-type tone arms, **$27.95***. VR-227 with .7 mil diamond stylus for record changer or turntable, **$24.95***.

TM-2G Tone Arm—a professional-type tone arm designed for use with General Electric stereo cartridges as an integrated pickup system, **$29.95***.

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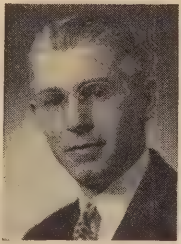
Oliver P. Ferrell
Editor
Hi-Fi Review

"... the VR-227 is a top performer. The frequency response ... is as flat as any cartridge tested to date. Channel-to-channel separation in the vital area between 700 cycles and 8000 cycles was equal to the very best stereo cartridges now offered the public."



Wm. A. Stocklin
Editor
Electronics
World

"... listening tests did not show up any flaws. Frequency response from 30 to 15,000 cps (limits of our test) was within 2.25 db of flat. Provides about the best channel separation available of any checked with the exception of [cartridge selling for $65.00] in the frequency range from about 5000 to 9000 cps."

C. G. McProud
Editor and
Publisher
Audio

"... is even better than its predecessor with respect to output, channel separation and extended frequency response and the two channels balance within ±2 db to 15,000 cycles. The shielding has been improved and the grounding of the shield and the method of shorting the two 'ground' terminals are well thought out."

For the finest monaural performance, too: the VR-22 or the famous VR-2.

Audio Components Section, Auburn, N. Y.

GENERAL ELECTRIC

Stereo Tape & Tape Recorders

New Developments And Quality Reproduction Make Tape An Important Factor In Hi-Fi Industry

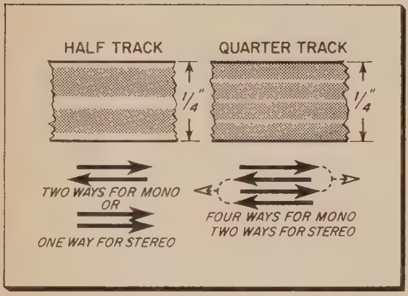


Fig. 1—The development of quarter-track tape doubles playing time offered by half-track tape and brings pre-recorded tape prices into closer competition with records.

• Tape may potentially provide the highest quality reproduction of all media. However, its inconvenience compared to records, high price of satisfactory equipment and olympian price tag of pre-recorded material have constantly plagued mass acceptance. Still, just prior to major stereo disc introduction, tape recorders and stereo tape were doing a brisk business.

Then came stereo discs. Some public confusion followed this announcement, and then the boom was lowered; RCA announced cartridge pre-recorded four track 3¾ ips tape. This was quickly followed by a storm of protests from advocates of four track 7½ ips, two track 1½ ips, two track 3¾ ips—with cartridge and without cartridge, until everyone in the industry was bewildered. Then, as sales declined because of consumers' hesitancy to purchase tape equipment that might shortly be obsolete, the record companies, major producers of pre-recorded tape, politely stopped tape production and concentrated on their stereo records. At least here was a medium that had only one system.

As owners of two track 3¾ and 7½ ips reel-to-reel equipment cried "foul" and the promise of cartridge tapes and equipment was virtually only a promise, some equipment manufacturers offered four track modification kits for existing equipment. This versatility seemingly soothed the feelings of opponents to cartridge 3¾ ips four track tapes and equipment sales began rising again.

Four Track Tape

Four track tape was introduced in an effort to lower pre-recorded tape prices by doubling playing time (see Fig. 1) and therefore make it competitive with stereo records. The cartridge tape premise is to enable tape to approach the convenience of record playing. However, the convenience of home *recording,* one of the incentives of purchasing tape equipment, is reduced by cartridges. In the mass market, cartridges may still be tape's great future.

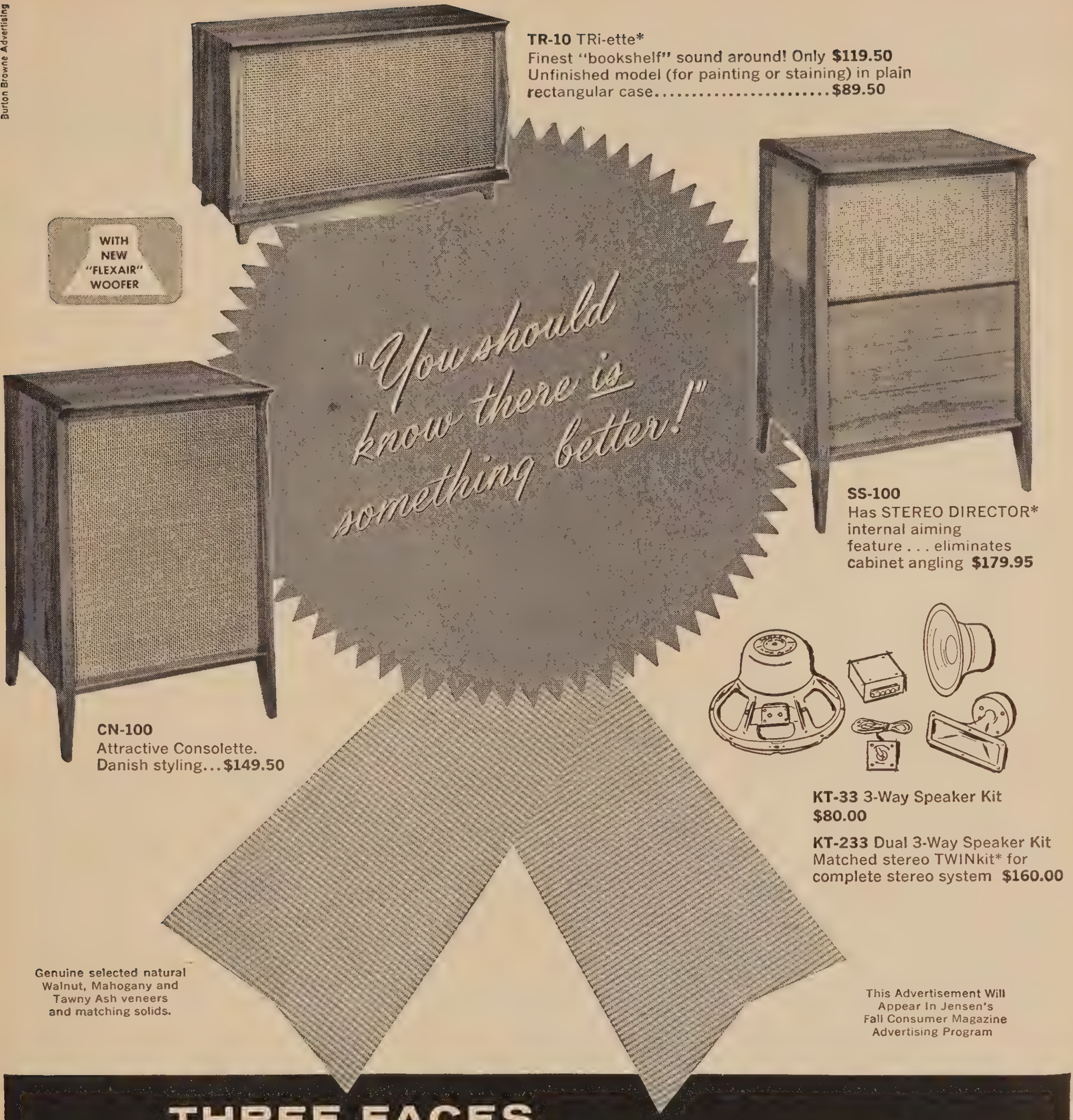
In addition to doubling tape playing time, proponents of four track tape can point to major advances made in the past year or two that reportedly allow today's four track tape to almost match the quality reproduction of earlier two track tape. Production of finer tape heads is a major factor in improving reproduction. However, two track tape reproduction has been correspondingly improved also. All things equal, the higher the speed, the wider the frequency response range.

Taking advantage of the improved frequency response available with narrower gap playback heads, a new speed, 1⅞ ips is being included with some tape recorders. It is said that its quality is comparable to the 3¾ ips tapes of a few years ago. This may appeal to consumers for economic reasons and longer playing time.

Taping broadcasts, or even discs, does not present any unusual problems with many of the newer stereo tape recorders. A problem may be presented, though, if "live" recordings are attempted. Two directional microphones with similar characteristics and response are desirable. They are usually not supplied with the tape machine since their cost is relatively high. Directional microphones enable recording with the microphones spaced further away from the performers. Therefore, the desired reverberation balance may be obtained from the environment, as opposed to the close spacing restrictions imposed by bi-directional microphones. Experimental recordings will develop the technique of proper balance.

Pre-recorded tape production is increasing rapidly, with 7½ ips in two and four track and 3¾ ips in four track cartridge tape. Prerecorded material in quantity will therefore be available again. With the decreased price of this material, the top reproduction quality offered, longer playing time, the cloud of obsolescence removed, recording provisions and numerous tape machines now for sale—the tape future once again assumes a prominent position in the consumer's sound world. •

Burton Browne Advertising



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LOUDSPEAKERS

The Stereo Installation—

Seemingly Routine Installations

• It seems a shame when a person spends a large sum of money for equipment capable of giving good stereo reproduction, and fails to get it for want of very little. Assume all equipment is at hand to reproduce the desired source material, connected together and the power has just been turned on. What is the result? If it is a perfectly delightful stereo sensation reverberating round the room, most technicians would faint from shock.

Complicating matters further, most new buyers don't realize whether they are hearing the stereo they vaguely dreamed about or not. They haven't the experience or knowledge to know the difference between proper and improper stereo hi-fi reproduction. Difficulties in initial set-up of equipment are not limited to the component field; package units have their share of troubles also.

A technician installing new equipment doesn't necessarily anticipate any particular difficulties, though a lot of things *could* happen. It's the multitude of possible troubles that evoke a sigh of relief when everything operates satisfactorily. Ignoring basic component defects, difficulties related to installation alone are bothersome. The technician may have to chase a hum-bug; phasing errors are pesky devils; poor connections can cause either channel, or both, to fail, etc. The individual trouble may seem remote, but the roulette wheel stops on one or another irritating gremlin often enough to eliminate installations from the category of a routine job.

Grounds

A hum-bug may be due to improper grounding at one or more points in the system. Since stereo systems are at least twice as complicated, wiring-wise, as an equivalent monophonic system, the probability of this undesirable property is increased.

A little colony of untidiness behind the preamplifier is a common sight. Cables are invariably connected in a haphazard way, intertwining in a manner resembling an Amazon jungle. Low-level and high-level cables, crossing each other and in varying degrees of proximity to power transformers and motors can pickup and induce hum.

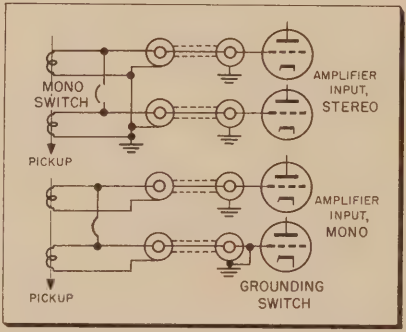


Fig. 1—It is possible to place a dead short across the phono input being used if the preamp's selector switch grounds all unused inputs and a changer or turntable has a paralleling cartridge terminal switch for playing monophonic discs. If both the preamp and changer or turntable can be switched to a monophonic position, it is advisable to render one switch inoperative.

If hum is present after the installation is completed, the cable "jungle" offers a formidable challenge to the technician's patience. Rather than be exposed to the possibility of fighting through almost untraceable cables, it would be wise to route cables in a neat and efficient manner.

Ground loops may produce hum due to a duplication in wiring or an accidental grounding. Input jacks and connectors, for example, may easily short to ground when inserting pin connectors. Each case, however, needs individual analysis and careful checking.

An important consideration when accomplishing installations is to ground the turntable or changer motor casing to the same ground the amplifying equipment uses. The same precaution should be taken with other source material equipment.

Some preamplifiers ground out unused inputs to avoid possible cross-talk. If a monophonic input is being used, for example, the selector switch grounds out all the other inputs. Some turntable or changer assemblies provide for combining stereo outputs when playing mono discs in order to avoid vertical rumble.

When such duplication exists, it is possible that a "dead" unit will result. When the preamp is switched to mono, it uses, say, the left input and grounds the right one. The paralleling switch on the changer or turntable connect the left input to the right input, as shown in Fig. 1 and places a complete short across both. Of course, this may easily be corrected by using one of two methods, not both.

Phasing

Phasing plays an important role in stereo reproduction. Most control units include reverse phase switches. If not, one of the speaker connections may be reversed. A simple check for proper speaker phasing is as follows: Using a mono record, the sound should emanate from the

Pitfalls & Precautions

May Prove Troublesome

center of two speakers when listening at the proper distance from the speakers, as shown in Fig. 2.

Disc phasing though, doesn't mean that other source material, such as tape decks, are properly phased. Experimentation will allow the technician to obtain proper phasing. Stereo tape should not be tested for phase by using a full track tape since a phase difference results from stacked heads.

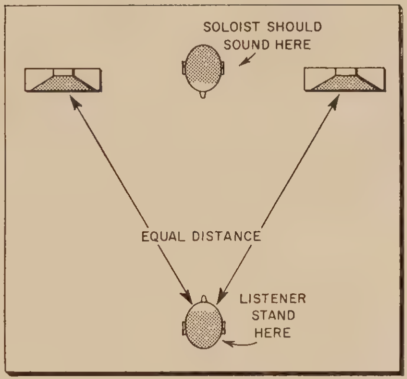


Fig. 2—A soloist's voice should appear to come from the center when the speaker outputs are properly phased and balanced.

Balance

A number of manufacturers are providing meters these days; a helpful addition, but not always the ideal answer. An audio meter cannot be read much closer than 1 db when riding program material. Assuming that both channels have equal sensitivity and speakers of equal efficiency, this may still not be good enough. It's necessary to be closer than 1 db to get accurately balanced stereo.

Speaker placement can also affect apparent balance. If one speaker has to feed a larger section of room area than the other, it will need a higher level to achieve apparent balance. Usually, the meter will not indicate this.

Some manufacturers are making available a differential meter which shows any output channel difference. This is a little better if provision is made to compensate for the aforementioned factor, but precise reading of program material is still lacking.

A single frequency signal, obtained from an audio oscillator, test record and even some stereo equipment (built into the unit) can give better accuracy, since the meter indicator is fairly steady. An equal signal can be fed into each channel. However, a pair of stereo-trained ears should also be used to take speaker placement into account.

General

Amplifier placement should always provide for sufficient ventilation of the unit. This is especially important with stereo amplifiers due to its greater number of heat producing components. Power and output transformers and tubes emit considerable heat, and unless this is taken into account, the life of the equipment can be shortened. Also, furniture may be discolored from the excessive heat and the danger of fire exists.

In addition to the usual complement of tools carried by the technician, a monophonic record, additional cables with pin connectors and enough wire for connecting speakers to the amplifiers should be included when installing a stereo system. •

Conversions To Stereo

Mono Equipment Owners Are Ready For The Change To Stereo

• "How can I convert to stereo?" is a question frequently asked. Stereo conversion of existing monophonic equipment entails good judgment on the part of the technician. Mainly, it's a question of what additional components are needed.

Acquiring a stereo cartridge is imperative, of course, and the choice is dependent upon the customer's present equipment. Many of the monophonic arms will accept the majority of stereo cartridges with very little change. Plug-in cartridge heads may usually be converted from two-pin to three-pin as shown in Fig. 1. A number of manufacturers provide conversion kits for this purpose, which is better than doing it yourself.

The choice of cartridge can be narrowed down by inspecting the record changer or turntable. Some mono changers or turntables transmit too high a vertical rumble component. Therefore, a cartridge that minimizes vertical rumble by mechanical or electrical means would be a judicious choice. If this choice is not customer approved, then a new changer or turntable will be required.

A mono-stereo switch should be added if the preamplifier system is to remain in the system. This switch, shown in Fig. 2, will parallel the cartridge output of each channel and cancel the vertical component, and therefore vertical rumble, when playing mono records. Installation of the switch should be as close to the cartridge as possible to avoid introducing hum. A switching arrangement providing greater flexibility is illustrated in Fig. 3.

Amplifier-Preamp

Considerable thought is needed when contemplating amplifier-preamplifier conversions. Often, it is probably best to replace the mono equipment with new stereo equipment. Many people, however, prefer to keep their mono equipment. In this case, it is advisable to secure another amplifier-preamplifier that is as near, specification-wise, to the existing unit as possible. Also, obtaining a stereo control center unit that carries the essential controls is a definite aid. These units usually contain a volume and balance control with a function selector switch. This will then become the main control unit for the system, leaving the two amplifiers more or less preset. A simple dual balance control is illustrated in Fig. 4.

If the mono system contains a separate preamp, rather than an integrated amp-preamp, a new stereo preamplifier should be purchased. The mono preamp will have to be considered expendable in this case, since conversion by revision or adding another preamp is not practical.

A second electronic channel may also be added by using amp-preamp-speaker units that are available from a few manufacturers. The choice of power and controls is somewhat limited, but the economy factor is present.

Impedance matching and amplifier input sensitivity are important considerations. It may be necessary to change the amplifier's load resistor to match the impedance of the stereo cartridge. The voltage output of the cartridge should be sufficient to adequately drive the amplifier and speakers to its proper level.

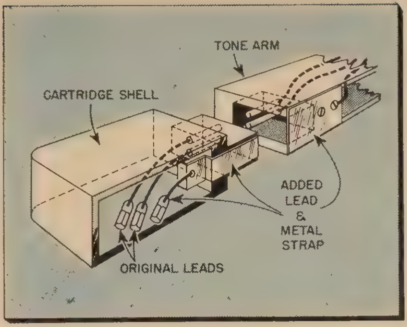

TONE ARM
CARTRIDGE SHELL
ADDED LEAD & METAL STRAP
ORIGINAL LEADS

Fig. 1—To convert a two-pin shell to accept a stereo cartridge, it is necessary to provide a connection for the third terminal.

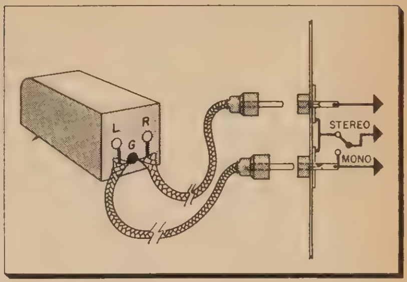

L
R
G
STEREO
MONO

Fig. 2—The hum-free switch shown enables the user to revert to monophonic playback.

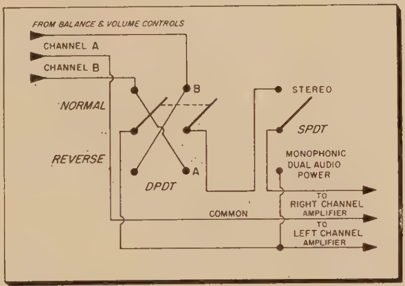

FROM BALANCE & VOLUME CONTROLS
CHANNEL A
CHANNEL B
NORMAL
REVERSE
B
A
DPDT
STEREO
SPDT
MONOPHONIC DUAL AUDIO POWER
COMMON
TO RIGHT CHANNEL AMPLIFIER
TO LEFT CHANNEL AMPLIFIER

Fig. 3—A SPDT switch offers versatility for stereo control. The listener can change from stereo to mono and can feed either channel into both amplifiers and speaker systems.

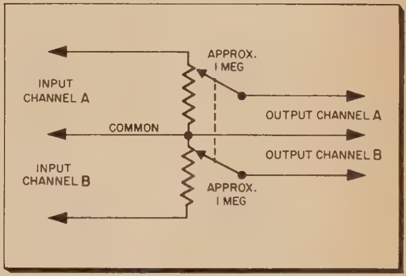

INPUT CHANNEL A
APPROX. 1 MEG
OUTPUT CHANNEL A
COMMON
OUTPUT CHANNEL B
INPUT CHANNEL B
APPROX. 1 MEG

Fig. 4—A balance control is needed when playing stereo material in order to equalize the sound from both channels. The dual linear control is wired in reverse order so that when one level goes up, the other goes down.

Record Changers

Aside from the vertical rumble consideration previously discussed, the muting switch presents a problem to the technician. The switch normally grounds the hot terminal during the change cycle and sometimes when the tone arm is at rest. The problem originates from the need of a duplicate set of contacts for stereo. In some cases it is possible to improvise another effective muting switch. Switch modifications will suggest themselves upon examination of the unit and the technician's mechanical ingenuity must be used. Stylus pressure should be checked whenever substituting one cartridge for another. Stereo cartridges employ lighter tracking forces and mono changers should also be checked for proper operation with the lighter tracking force.

Tape Recorders

Tape recorder conversions to stereo do not necessarily imply conversion from mono to stereo with two tracks. Don't forget the four track introduction. Many owners of home tape recorders will be interested in converting their present two track unit to a four track one for economy reasons. The quality loss will not be a factor since new tape head designs have resulted in improved frequency response. Recorder and tape head manufacturers offer conversion kits for many tape recorders.

Hum & Noise

The more functions added to a conversion, and therefore the more complex a unit is, the greater chance there is of increasing hum and noise. Extra shielding and experimental routing of leads are necessary precautions in order to minimize hum and noise.

Speakers

When choosing speakers for the second channel, consideration must be given to both the present mono speaker system and the second channel amplifier. If the existing speaker is a small unit, it should not be too difficult to obtain a fairly close match. But if it is a huge enclosure with a highly regarded woofer, the customer usually wishes to retain it in his system. In this instance, it may be wise to consider satellite speakers. Two small speakers can carry middle and high frequencies and by using crossover networks, as shown in Fig. 5, the bass frequencies can be fed to the existing mono speaker. •

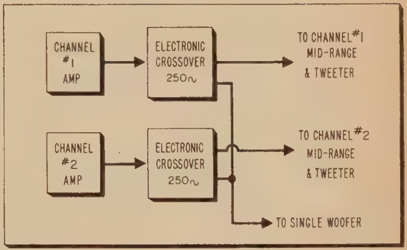

CHANNEL #1 AMP
ELECTRONIC CROSSOVER 250∿
TO CHANNEL #1 MID-RANGE & TWEETER
CHANNEL #2 AMP
ELECTRONIC CROSSOVER 250∿
TO CHANNEL #2 MID-RANGE & TWEETER
TO SINGLE WOOFER

Fig. 5—Crossover networks inserted between the amplifiers and speakers removes the bass component from each channel and directs it to the system containing the woofer.

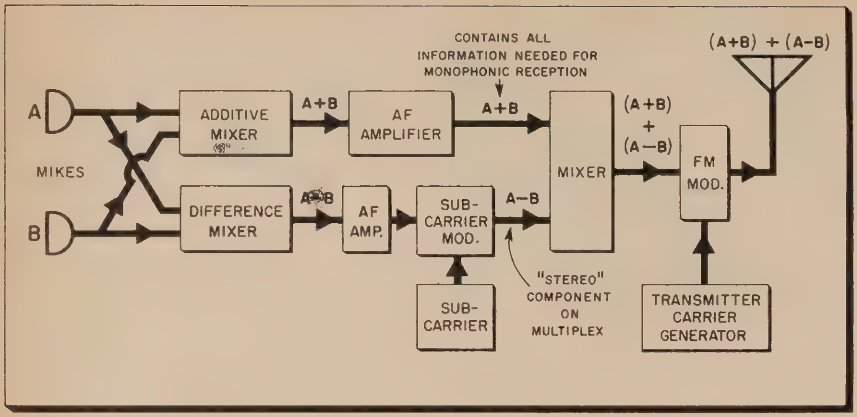

CONTAINS ALL INFORMATION NEEDED FOR MONOPHONIC RECEPTION
(A+B) + (A−B)
A
MIKES
B
ADDITIVE MIXER
A+B
AF AMPLIFIER
A+B
DIFFERENCE MIXER
A−B
AF AMP.
SUB-CARRIER MOD.
A−B
MIXER
(A+B) + (A−B)
FM MOD.
SUB-CARRIER
"STEREO" COMPONENT ON MULTIPLEX
TRANSMITTER CARRIER GENERATOR

Fig. 1—The sum and difference technique supplies all the information needed for monophonic listening to the main carrier. The sum signals modulate the main carrier, while the difference signals, with one signal reversed in phase, is impressed on the subcarrier.

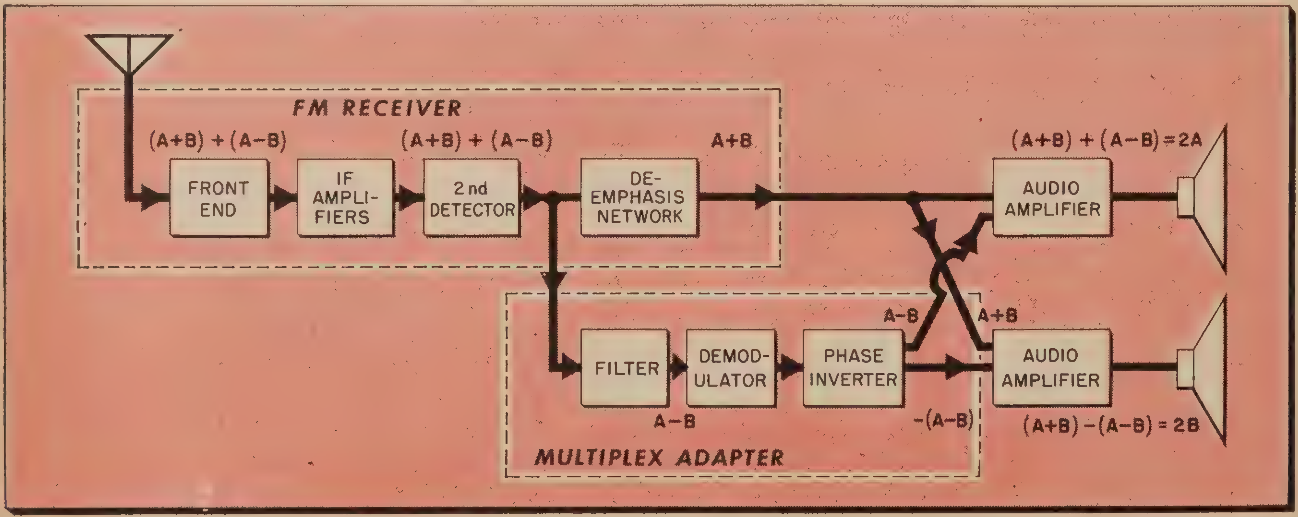
Report on Stereo Broadcast

Industry Anxiously Awaits Acceptance Of A Standard Broadcast System Among The Many Proposed

• A few tuner manufacturers are already marketing multiplex adapters. Others are including provisions to connect an adapter into their present tuner to counter the possibility of obsolescence. Also offered are many stereo tuners capable of receiving AM and FM transmissions, both at the same time. It wasn't too long ago, that AM-FM tuners could receive either signal, but not simultaneously.

The industry is anxiously awaiting acceptance of a practical stereo broadcast system for nation-wide use. What is delaying acceptance of a standard system? It seems that this is a question whose answer has many facets. One positive fact, though, is that a shortage of ideas in the technical area does not exist. On the contrary, there are enough different proposals to promote confusion—rather than assist in solving the issue.

Fig. 2—Conventional FM receivers may pick up the complete multiplex transmission, but only the monophonic information (A + B) can be heard. (A — B) can be picked up by a multiplex adapter and fed into both audio systems to aid in establishing the right and left sense.


FM RECEIVER
(A+B) + (A−B)
FRONT END
IF AMPLI-FIERS
(A+B) + (A−B)
2nd DETECTOR
DE-EMPHASIS NETWORK
A+B
(A+B) + (A−B) = 2A
AUDIO AMPLIFIER
A−B
A+B
FILTER
DEMOD-ULATOR
A−B
PHASE INVERTER
−(A−B)
AUDIO AMPLIFIER
(A+B) − (A−B) = 2B
MULTIPLEX ADAPTER

AM vs FM

Many refer to the available choices as being between the "Crosby" system and "some other" system. A number of alternates to the Crosby system have been proposed, including FM-AM and AM stereo broadcasting. Initial reactions include concern regarding the FCC's lack of dispatch in resolving the situation. However, upon further consideration, most critics will agree that it is generally best to thoroughly review all proposals, permitting them to operate experimentally, rather than make a hasty—and possibly unfortunate—choice. Unlike the record industry, the FCC will not be stampeded into a particular system.

Although many persons deprecate the hi-fi potential of AM transmission and feel it would be an injustice to fidelity aspirations if a stereo broadcast system based on it were approved, we should realize that AM stereo can also serve a useful purpose.

Undoubtedly, AM has the wider audience. In view of this, the majority of people already own at least 50% of an all AM stereo receiver. Minor modifications of an AM radio and an adapter is all that is needed for AM stereo reception. Compare this with the requirements of an FM system; the large majority of the population would have to purchase a complete unit in order to enjoy stereo broadcast. Add to this, the fact that present AM broadcast hours dwarf FM air-time and you have the nucleus of a strong argument in favor of an all AM stereo broadcast system.

On the other hand, FM advocates can elaborate on the fidelity inadequacies of AM, stating, its rather a short-sighted viewpoint to consider present commercial practicabilities in preference to the ultimate fidelity that the American public deserves. Wider bandwidth and external noise immunity are strong arguments.

FM-AM stereo advocates point out that using their system will provide fewer hardships, from both a broadcast station and consumer viewpoint, than any of the others proposed. A large number of stations already have both FM and AM facilities and the great proportion of people presently own an AM radio, while some also have an FM receiver. Controversy exists with this system, too. First, the quality of AM is not comparable to FM. Also, the broadcast microphones can not take full advantage of stereo possibilities, since they can't be spaced too widely. If they are, persons receiving either AM or FM only would not obtain the complete signal, thereby giving poorer fidelity on either individual receiver than is presently broadcast.

The Federal Communications Commission will eventually decide upon a standard stereo broadcasting system or systems, just as it did with TV. In the latter case, FCC standards were based on the recommendation of an industry-wide group. Once again the industry has formed such a group—the National Stereophonic Radio Committee—to sift the many system proposals and come up with unified recommendations for the FCC.

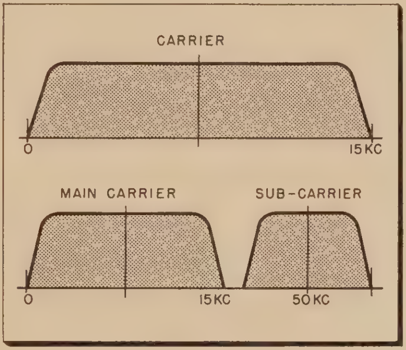


Fig. 3—Restricting the deviation of the main programs leaves room for one or more sub-carriers to carry additional programs.

Typical Proposals

The Crosby system, one of the leading proposals, is a multiplex system as shown in Figs. 1 and 2. The sum and difference technique shown in Fig. 1, provides two channel information. The sum signals, containing all the information, (A+B), modulate the main carrier, while the difference signals obtained by reversing the phase of one of the signals, (A—B) are impressed on the subcarrier. The subcarrier operates in an inaudible range and does not interfere with normal reception. See Fig. 3.

The FM receiver picks up the entire transmission, but only one channel can be heard (A+B) unless a multiplex adapter is connected to the receiver. When the adapter is connected, the (A—B) signal, thus far inaudible, is picked up through a filter and demodulated, followed by a 180° phase inversion. The main unit, already having an (A+B) signal, is fed a portion of the adapter's (A—B) signal before the phase is changed. The adapter unit, in turn, is fed with part of the main unit's (A+B), which is added to its phase inverted —(A—B) signal. The result is the same separated information impressed on the left and right hand microphones at the studio.

$$(A+B) + (A-B) = 2A$$
$$(A+B) - (A-B) = 2B$$

Another multiplex proposal is the Halstead system, whose block diagram is shown in Fig. 4. One of the channels in this system is narrow band and therefore cannot provide full fidelity.

An AM stereo proposal by Philco uses a combination AM and phase modulation, resembling FM. It is compatible with an ordinary AM receiver, yet offers stereo when an adapter unit and minor modification of the AM receiver is accomplished. It uses the sum and difference frequency method to provide stereo.

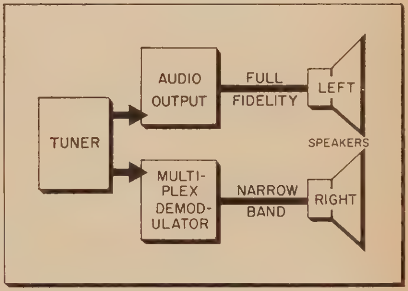


Fig. 4—The Halstead stereo receiver proposal includes a wide-band and low-band channel.

Meanwhile, tuner manufacturers are producing tuners that will not be outdated regardless of what system is finally chosen. •

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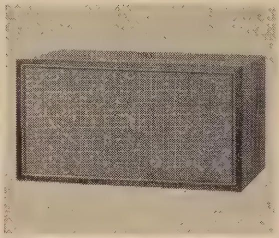

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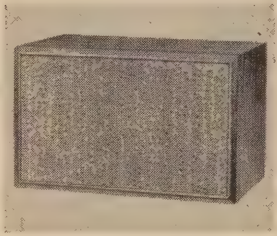

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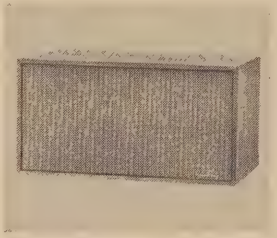

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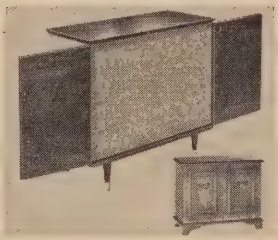

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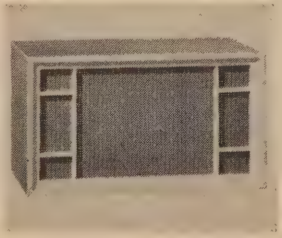

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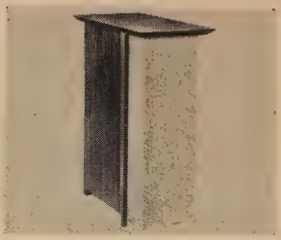

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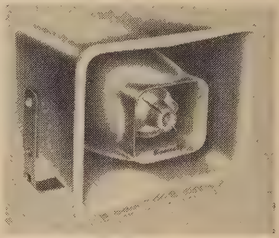

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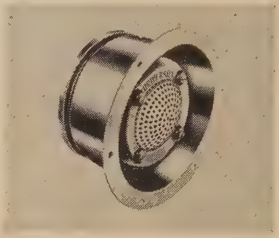

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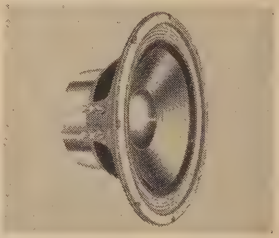

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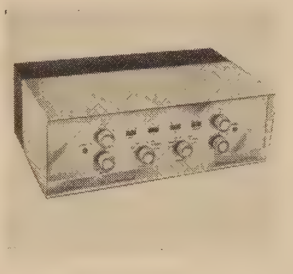

Dual preamp/amplifier, 14 watts/channel, has 20 to 20,000 cps response ±1 db at 14 watts. Hum is 80 db below rated output. IM distortion 0.5% at 10 watts. Harmonic distortion less than 1% at rated output. $99.95 wired. $64.95 kit. Also, not shown SP-6A dual preamp/amp. $62.95 wired. $39.95 kit. SA-25 dual preamp/amp. $89.95 wired. $59.95 kit.

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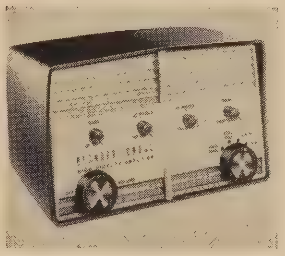

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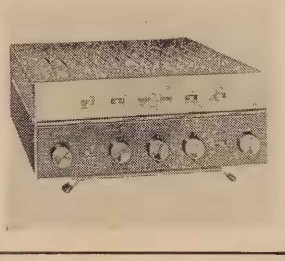

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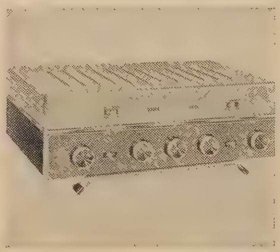

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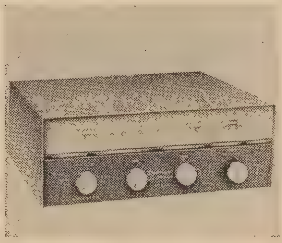

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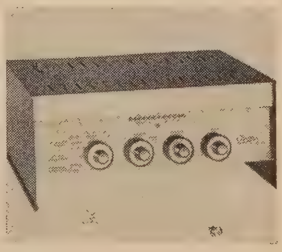

Dual preamp/amplifier 25 watts/channel has 20 to 20,000 cps response/channel. Features 2 concentric clutch action dual balance controls. Two separate 25-watt push-pull output stages with inverse feedback. $99.50. Also: PA110 preamp, $12.95; A-2000PA Preamp/Amplifier $69.50. Both single channel. ST100 dual amplifier $59.50.

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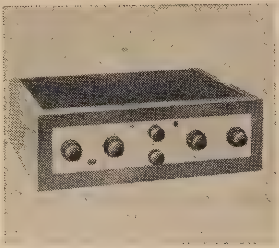
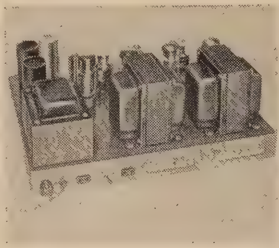
EICO HF-81

Dual preamp-amplifier, 14 watts/channel, has 10 to 100,000 cps response ±0.5 db at 1 watt/channel. Hum, low level phono, 60 db below rated output; high level inputs, 75 db below rated output. IM distortion 2% at 14 watts/channel. $69.95 wired; $109.95 kit.



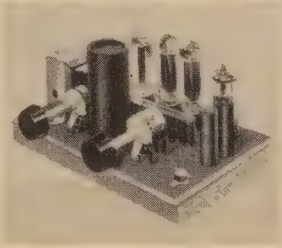
EICO HF-87

Dual power amplifier, 35 watts/channel, has 5 to 100,000 cps ±0.5 db at 1 watt/channel. IM distortion 1% at 35 watts/channel. Harmonic distortion 1% at 20 cps, 30 watts/channel. Has input level controls; 4,8,16 and 32 ohm output taps. $114.95 wired, $74.95 kit. Also, not shown, HP86 14 watt amplifier. $74.95 wired, $43.95 kit.



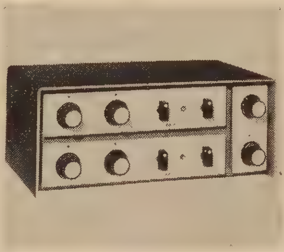
ERIE PAC-AMP-1

Single channel, 2-watt power amplifier has 30 to 12,000 cps response ±0,-3.5 db at 1 watt. Hum is 36 db below rated output. Harmonic distortion 5%. Includes plug-in components. Easily assembled. $12.95 kit.



FAIRCHILD 248

Dual stereo preamp has 2 amplifier outputs, loudness control, rumble filter, and master volume control. Response is 20 to 20,000 cps ±1 db. Hum is —85 db below rated output. Harmonic distortion is 0.1% at 1 v. $239.50. Also, not shown, Model 255A 30-watt amplifier. $124.50.

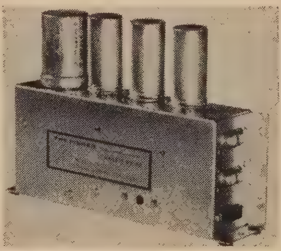


FISHER 400CA

Dual preamplifier has 20 to 25,000 response ±0.5 db. Hum is 85 db below rated output. Harmonic distortion is less than 0.15% for 2 v out or 0.30% for 5 v out. $174.50. Also, not shown, model X-101A dual 20 watt/channel preamp/amplifier. $194.50.

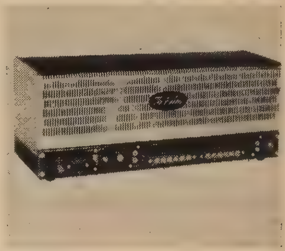
FISHER PR-66

Dual preamplifier has continuous power/channel gain of 40 db at 1,000 cps. Response is 20 to 20,000 cps ±2 db. Hum is 68 db below rated output. $29.95.



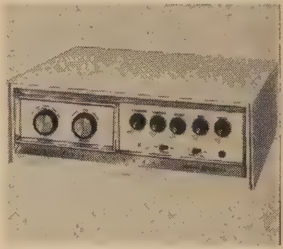
FISHER SA-300

Dual power amplifier, over 30 watts/channel, has 20 to 20,000 cps response ±0.5 db at full output. More than 100 db hum below rated output. IM distortion less than 0.08% at full output. Harmonic distortion less than 0.1%. Has controlled frequency response and facilities for variable damping. $169.50.



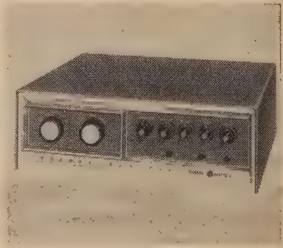
GENERAL ELECTRIC 7700

Dual preamp/amplifier, 28 watts/channel, has 20 to 20,000 cps response ±0.5 db. Hum is 68 db below rated output. Harmonic distortion is below 1% at full rated power. Other features include: dual concentric bass and treble controls; includes cases which match AM/FM tuner. $189.95.



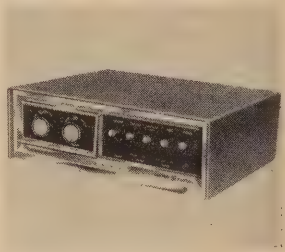
GENERAL ELECTRIC 7600

Dual preamp/amplifier, 20 watts channel, has 20 to 20,000 cps response ±0.5 db. Hum is 65 db below rated output. Harmonic distortion is below 1%. Has dual concentric bass and treble controls. Case matches AM/FM tuner. $139.95.



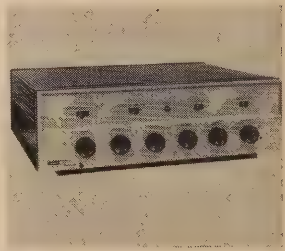
GENERAL ELECTRIC MS2000

Dual preamp/amplifier, 14 watts/channel, has 20 to 20,000 cps response ±0.5 db. Hum is 55 db below rated output. Harmonic distortion is below 1%. Case matches AM/FM tuner. $129.95. Also, not shown MS4000 dual preamp/amplifier, 20 watts/channel. $169.95.



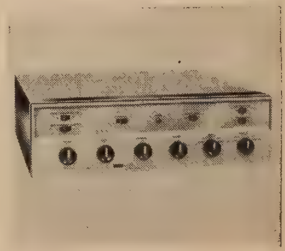
HARMAN-KARDON A230

Dual preamp/amplifier, 15 watts/channel, has 15 to 70,000 cps response ± 1 db at 1 watt. Hum is 80 db below rated output. IM distortion is 2% at 15 watts. Harmonic distortion is 1%. Third channel speaker connections can be controlled by speaker switches. Illuminated push-button on/off switch. $109.95.

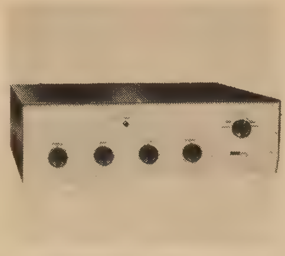


HARMAN-KARDON A260

Dual preamp/amplifier, 30 watts/channel, has 20 to 20,000 cps response ±1 db at 30 watts. Hum is 90 db below rated output. IM distortion is 1% at 30 watts. Harmonic distortion 0.3%. Third channel speaker connections can be controlled by speaker switches. Has speaker selector switches, phasing switch. $199.95.

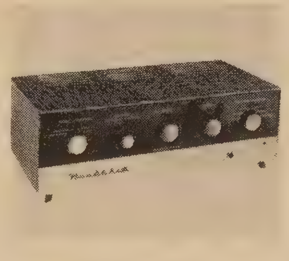


HARMAN-KARDON A220



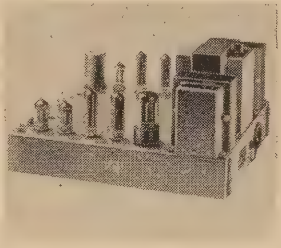
Dual preamp/amplifier, 10 watts/channel, has 20 to 20,000 cps response ±1 db at 1 watt. Hum is 70 db below rated output. IM distortion is 2% db at 10 watts. Harmonic distortion is 0.5% at 5 watts. Has illuminated push-button on/off switch and new 7408 output tubes. $79.95.

HEATH SA-2



Dual preamp/amplifier, 12 watts/channel, has 20 to 20k cps response ±1 db at 12 watts. Hum is 65 db below rated output. IM distortion 0.3% at 12 watts. Harmonic distortion is 0.5%. Other features include channel reversing, concentric volume controls, ganged tone controls and speaker phasing switch. $52.95.

LEAK STEREO 20

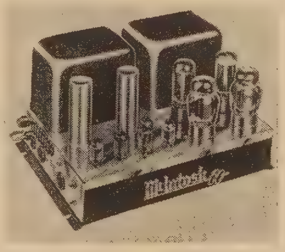


Dual amplifier, 12 watts/channel, has 20 to 20,000 cps response ±0.5 db at 12 watts. Hum 80 db ±3 db below rated output. Harmonic distortion 0.1%. $149.00. Also, not shown, "Point One Stereo" preamp. $119.50. Stereo 50, 25 watts/channel amplifier. $199.00.

McINTOSH MC30

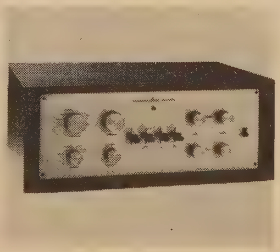
Single channel 30-watt power amplifier has response of 20 to 30,000 cps ±0.1 db at 30 watts; and 10 to 100,000 cps ±1.0 db at 15 watts. Hum is 90 db or more below rated output. IM distortion 0.5% for any two frequencies if peaks are below 60 watts. Harmonic distortion 0.3% at 30 watts. $143.50.

McINTOSH MC60



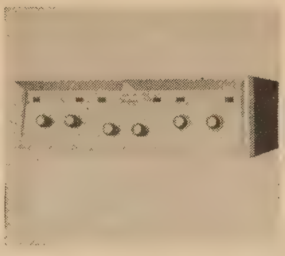
Single channel power amplifier, 60 watts, has response of 20 to 30,000 cps ±0.1 db at 60 watts; and 10 to 100,000 cps ±1.0 db at 30 watts. Hum is 90 db below rated output. IM distortion is 0.5%. Harmonic distortion 0.3% at 60 watts. Has 0.5 v input sensitivity, 600 ohm and 70.7 v outputs. $198.50.

MARANTZ 7



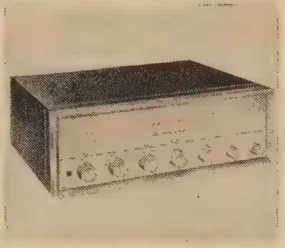
Dual preamp has response of 20 cps to 20 kc ±0.5 db. Total noise 80 db below 10mv phono input. IM distortion 0.15% at 10 v. Has stepped tone controls of feedback type, separate for each channel. Bass curves approximate loudness correction curves. $249.00. Also, not shown, Model 5, 30-watt amplifier. $147.00.

PACO SA-40



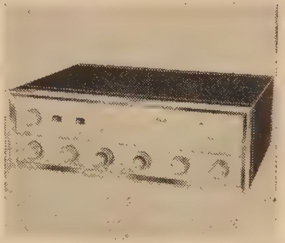
Dual Preamp/amplifier, 20 watts/channel, has 30 to 90,000 cps response ±1 db at 1 watt. Hum is 70 db below rated output. IM distortion less than 1% at low level input terminals at 20 watts. Harmonic distortion less than 0.2% at 20 watts. Two phono inputs to permit use of both turntable and changer, $129.95 wired. $79.95 kit.

PILOT SP-210



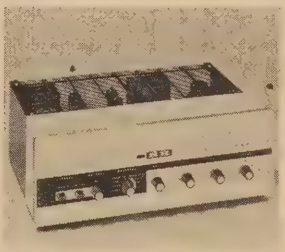
Dual preamplifier (powered from separate stereo amplifier SA-232 $89.50 or SA 260 $139.50, not shown.) Response is 20 to 20,000 cps ±1 db. Hum and noise 80 db below 1 volt. Harmonic distortion 0.2% at max. sensitivity. $89.50.

PILOT 240



Dual preamp/amplifier, 15 watts/channel, has 20 to 20,000 cps response ±1 db. Hum and noise 80 db below full output. Harmonic distortion 1%. $129.50. Also, not shown, 245-A Preamp/amplifier, 40-watter, $199.50; 216-A preamp, $199.50.

SARGENT-RAYMENT SR-1717

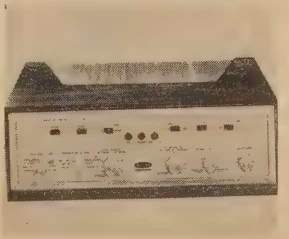


Dual preamp/amplifier, 20 watts/channel, has 20 to 20,000 cps response ±1.5 db at 12 watts. Hum is 70 db below rated output. IM distortion is 1.5% at 20 watts. Harmonic distortion is 0.32%. $189.60. Also, not shown, model SR-5100 dual power amplifier, 50 watts/channel. $183.60.

H. H. SCOTT 222

Dual channel, plus center channel, preamp/amplifier, 12 watts/channel, has 20 to 20,000 cps response ±1 db at 12 watts. Hum is 80 db below rated output. IM distortion 0.3% at 12 watts. Harmonic distortion 0.8%. Other features include dual tone controls, phase switch and center channel output. $139.95.

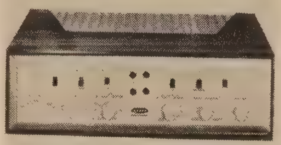
H. H. SCOTT 299



Dual channel preamp/amplifier, center channel optional, 20 watts/channel, has 20 to 20,000 cps response ±1 db at 17 watts. Hum is 80 db below rated output. IM distortion 0.3% at 17 watts. Harmonic distortion 0.8%. Includes tone control calibration to enable use as an electronic crossover. $199.95.

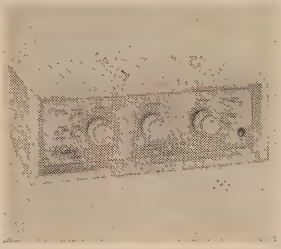
H. H. SCOTT 130

Dual channel, plus center channel, preamplifier has 19 to 35,000 cps response ±1 db at 2.5. Hum is 80 db below rated output. Harmonic distortion 0.15%. Has facilities for balancing both channels, dual pickup level adjustment. Inputs are 5 stereo channels including 2 low level. $169.95.



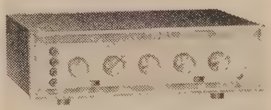
SHELL 1010P

Dual amplifier, 10 watts/channel, has 30 to 20,000 cps response ±2 db. Hum and noise is —60 db. Distortion less than 1%. Input sensitivity 3 v. rms for full output, 40 db separation. $78.00.



SHERWOOD S-1000 II

Single channel, 36-watt, preamp/amplifier has 20 to 20,000 cps response ±0.5 db at 36 watts. Hum is 60 db below rated output. IM distortion 1.5% at 36 watts. Harmonic distortion 0.50%. $109.50.



ACRO STEREO 20-20

Dual-channel power amplifier, 18 watts/channel, has 20 to 20 kc cps response ±1 db @ 18 watts. Hum is 95 db below rated output. IM distortion 1.5% @ 18 watts. 0.6% @ 16 watts. Harmonic distortion 0.1%. Has input/output parallel switch. Wired $99.50. Kit $69.50.

ALTEC LANSING 353A

Dual preamp-amplifier, 50 watts/channel, has 20 to 25,000 cps response ±0.50 db @ 20 watts. Hum is 80 db below rated output. $199.50. Also, dual preamp 445A, 20 to 22,000 cps ± 0.5 db. Pushbuttons. $189.00.

ALTEC LANSING 345A

Dual power amplifier, 100 watts/channel, has 20 to 22,000 cps ±0.50 db @ 60 watts. Versatile for stereo-mono systems. Widely used by recording studios. $270.00. Also, model 355A single channel preamp/amplifier. $111.00.

ARKAY CS-12

Dual preamp/amplifier, 12 watts/channel, has 20 to 20,000 cps response ±1 db at 12 watts. Hum is 70 db below rated output. IM distortion 1.2% at 10 watts. Harmonic distortion 0.9%. Has 3 v. input for full output. $57.50 wired. $36.95 kit.

BELL 3030

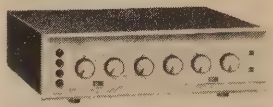
Dual preamp/amplifier, 15 watts/channel, has 40 to 20,000 cps response ±1 db below 15 watts. Hum is 78 db below rated output. IM distortion is 1% @ 15 watts. Harmonic distortion is 1% @ 15 watts. $149.95. Also, Model 2221 dual channel 10-watt preamp/amplifier. $99.95.

CHANNEL MASTER 6600

Dual preamp/amplifier, 16 watts/channel, has 20 to 20,000 cps response ±1 lb @ 1 watt. Hum: phono 60 db below 10 mv for full output. Harmonic distortion 1% at full output. Other features: Continuous equalization; sensitivity (phono) 3 mv @ 400 cycles for full output. $99.95.

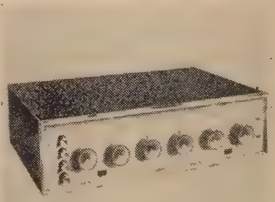
SHERWOOD S-5000

Dual preamp/amplifier, 20 watts/channel, has 20 to 20,000 cps response ±0.5 db at 20 watts. Hum is 60, phono; 80, radio, db below rated output. IM distortion 1.5% at 20 watts. Harmonic distortion 0.5%. $189.50. Also, not shown, model S-1060 single channel preamp/amplifier. 60 watts. $149.50.



SHERWOOD S-4400

Dual preamp/amplifier, 36 watts/channel, has 20 to 20,000 cps response ±0.50 db at 36 watts. Hum is 60, phono; 80, radio, db below rated output. Im distortion is 1.5% at 36 watts. Harmonic distortion 0.5%. Designed for use with model S-360 basic power amplifier. $159.50 for S-4400. $59.50 for S-360.



STROMBERG-CARLSON ASR-433

Dual preamp/amplifier, 12 watts/channel, has 20 to 20,000 cps response ±1 db at 12 watts. Hum is 63 db below rated out. IM distortion less than 1% at 5 watts. Harmonic distortion less than 1%. Other features include: individual controls plus master gain; tone balance; mono switch. $129.95.

CHANNEL MASTER 6620

Single channel, 20-watt preamp/amplifier has 20 to 20,000 cps response ±0.50% db at 1 watt. Hum: phono 60 db below 10 mv for full output. Harmonic distortion 1% @ 20 watts. Other features: continuous equalization; sensitivity (phono) 3 mv @ 400 cycles for full output. $79.95.

DE WALD N-1200B

Dual preamp/amplifier, 15 watts/channel, has 20 to 20,000 cps response ±1 db at 15 watts. Hum is 75 db below rated output. IM distortion 1% at 15 watts. Harmonic distortion 1%. Has facilities for direct tape recording and monitoring. $99.95. Also, N-2200 25-watt preamp-amp, $139.95; N-500-B 15-watt, $52.95.

GROMMES 20LJ

Dual preamp/amplifier, 10 watts/channel, has 20 to 20,000 cps response ±0.5 db. Hum is 80 db below rated output. IM 3%. Harmonic distortion 2%. $69.95. Cover $10.00. Also, 20SJK dual preamp/amplifier, 10 watts/channel $59.50 kit. 24PG preamp/amplifier 12 watts/channel $99.95. Cover $12.00.

GROMMES 40PGA

Dual preamp/amplifier, 20 watts/channel, has 20 to 20,000 cps response ±0.5 db at rated watts. Hum is 80 db below rated output. IM 2% at rated watts. Harmonic distortion 1%. Has inputs for stereo phono, tape or tuner. $167.95. Cover $12.00. Also, 28PG, 14 watts/channel, $119.95.

HEATH SA-3

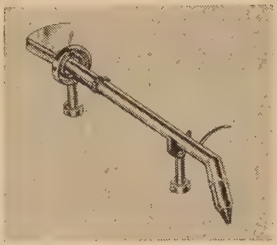
Dual preamp/amplifier, 3 watts/channel, has 50 to 20k cps response ±1 db at 3 watts. Hum is 65 db below rated output. IM distortion is 2% at 3 watts. Harmonic distortion is less than 3%. Other features include channel reversing switch, speaker phasing switch and ganged tone controls. $29.95.

ROBERTS A-901

Single channel, 6-watt preamp/amplifier has 40 to 15,000 cps response ±2 db at 4 watts. Hum is 50 db below rated output. Harmonic distortion is less than 3%. Portable. Has 8" speaker and speaker output jack. $149.50. Also, model A-903 single channel, 6-watter. $119.50.

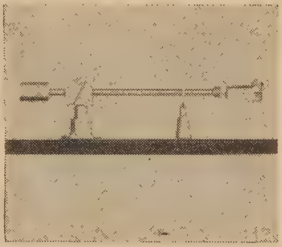
Arms

DYNACO Stereodyne



Arm with cartridge plays up to 12" records and has 4 terminals. Resonance is below audibility. Features include dynamic balance, single hold mounting, and 2 gram tracking. $49.95.

EMPIRE 98

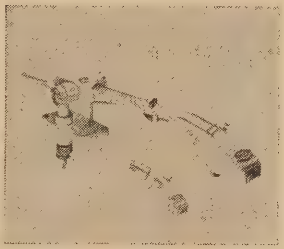


Stereo balanced arm without cartridge. Plays up to 12" records. Has 4 terminals. Arm resonance is 12 cps ± 2 db. Also 98P plays up to 16" records. $34.50 satin gold finish. $38.50 satin chrome.

FAIRCHILD 282

Arm plays up to 16" records. Resonance 7 cps. Has 4 terminals. Supplied with extra slide; 2 pair 6' cables integral with arm; both spring and mass counterbalanced. $42.50.

GARRARD TPA/12



Arm with plug-in head replaces TPA/10 tone arm. Two leads wired for stereo to take any cartridges. Usable for up to 16" records. Fixed length and tracking angle preset. Independent weight adjustment screw atop arm. Single hole mounting. Price $19.50.

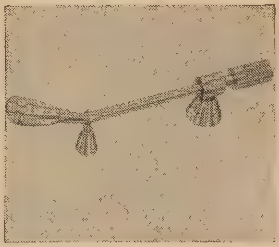
GENERAL ELECTRIC TM-2G

Arm, statically balanced, features 2-step adjustment for precise setting of tracking force between 0 and 6 grams. Play up to 12" records. Designed for VR-II cartridge. Built-in arm rest. Height adjustable from ⅜ to 2¼". 1 ground & 4 lead terminals. $29.95.

PICKERING 196

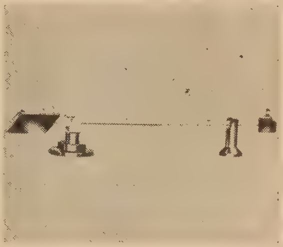
Unipoise arm complete with Stanton stereo Fluxvalve. Plays up to 12" records. Has 3 terminals. Resonance is 15 cps. $49.50.

REK-O-KUT S-120



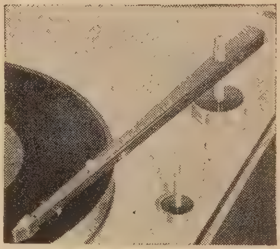
Arm plays up to 13" records. Resonance is 14 cps. Has 4 terminals. Plug-in heads. $27.95. Also, not shown, model S-160 plays up to 16" records. $30.95.

H. H. SCOTT 1000



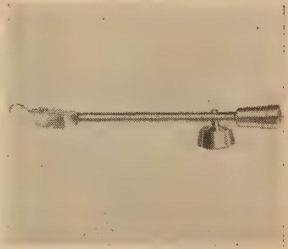
Matched arm and cartridge system. Plays up to 12" records. Has 5 terminals. Contains monophonic coil for use with single channel records. $89.95.

SHURE M212



Arm plays up to 12" records. Has 3 terminals. Resonance is eliminated by dynamic damping. It is scratch-proof and reduces record wear. $89.50. Also, not shown, model M216, plays up to 16" records. $89.50.

STROMBERG-CARLSON RA-498



Arm plays up to 12" records. Has 5 terminals. Resonance is 10 cps. Has needle point suspension adjustment and weight and center balancing. $24.95.

DUOTONE GP2-3

Arm with piezo cartridge plays up to 12" records has 2 terminals. With cartridge and arm rest. Overall length is 8¾" with tracking centers of 7". Adjustable counter balance spring permits varying of tracking weight. $14.50.

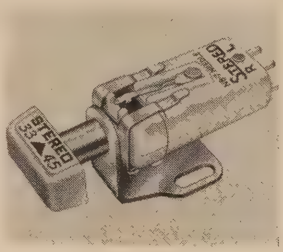
WEATHERS MC-1 (D or S)

Arm with cartridge plays up to 12" records. Has 4 terminals. Resonance is 18 cps. Other features include viscous damping in both directions, adjustable counterweight, vibration-isolating base. $55.95 diamond. $48.26 sapphire. Also, model MT-5, without cartridge, $38.50.

CARTRIDGES

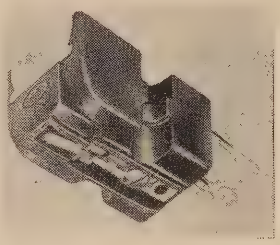
ASTATIC 76-TB

Turnover crystal cartridge has 30 to 10,000 cps ±3 db response. Tracking is 8 to 9 grams. Compliance 0.8. Separation 20 db. Output 2.5 v/channel @ 1,000 cps. With 4 terminals and Astatic N8-7 and N8-3 mil sapphire needles. $7.95. Also, not shown, 70-TB exclusive for VM changer.



COLUMBIA SCID

Stereo ceramic cartridge, in-phase connected, has 30 to 10,000 cps response ±3 db. Tracking is 5 to 7 grams. Compliance is 2x10-6. Separation 20 db. Output 0.4 volt/channel @ 5 cm/sec-1 KC. 3 terminals. Diamond 0.7 mil. $24.25. SC1S, sapphire needle, $17. Also, similar model SC2D wired out of phase.

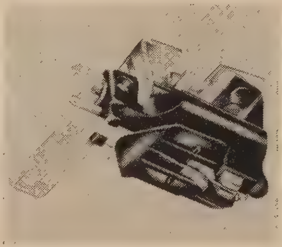


COLUMBIA
Professional 55

Ceramic cartridge has 20 to 15,000 cps response ±3 db. Tracking is 1.5 to 4 grams. Compliance: 3. Separation is 20 db. Output 0.4 v/channel @ 5 cm/sec— 1 KC. 3 terminals. Diamond 0.5 mil. Complete with 2 equalizing networks for low and high level inputs. $28.95.

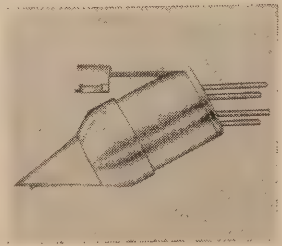
DUOTONE GP73

Turnover stereo cartridge has 40 to 15,000 cps response. Tracking is 2 to 4 grams. Separation 25 db at 1 kc. Output 1 volt/channel at 1 kc. 4 terminals. .7 and 3 mil needles, one is diamond; other sapphire. $14.70. Also, not shown, GP65-3 piezo cartridge, $8.45.



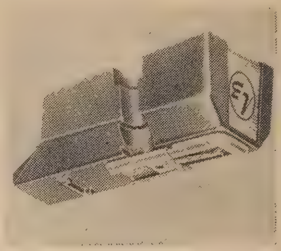
DYNACO Stereodyne

Stereo magnetic cartridge has response of 30 to 15,000 cps ±2.0 db. Tracking is 2 to 4 grams. Compliance is 5. Separation in excess of 22 db. Output 7 mv/channel @ 5 cm/sec. 4 terminals. 0.7 mil diamond needle. $29.95.



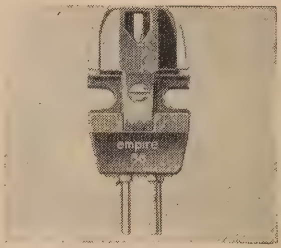
ELECTRO-VOICE 31D-5

Stereo ceramic cartridge has 20 to 20,000 cps response ± 2 db. Compliance is 3.5. Tracking is 2 to 4 grams. Separation 28 db isolation at 1,000 cycles. Output is 300 mv/channel. Has 4 terminals and 0.5 mil diamond needle. $22.50



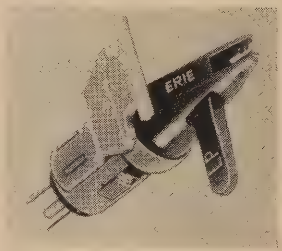
EMPIRE 88

Moving magnet cartridge has 20 to 20,000 cps reponse ± 2 db. Tracking is 2 to 8 grams. Compliance 5. Separation 25. Output 5 mv/channel at 3.8 cm/dyne. 4 terminals. Has .7 mil diamond needle. $24.50. Also 88S1, with sapphire 0.7 needle, $18.50. S887 sapphire replacement $6.50. S88-7RD diamond replacement $12.50.



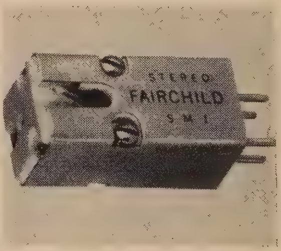
ERIE 1303

Ceramic cartridge has 16 to 20,000 cps response. Tracking is 4 to 6 grams. Compliance: vertical, 2; horizontal 2. Separation 20 db at 1 kc, 10 db at 5 kc. Output 0.5 v/channel at 1 kc. Has 3 terminals and 0.7 mil sapphire needle. $8.95. Also, not shown, model 1304. Has 0.7 mil diamond stylus. $16.50.



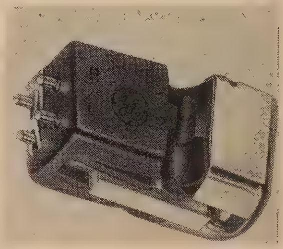
FAIRCHILD SM-1

Magnetic cartridge has 20 to 15,000 cps response ±2 db. Tracking is 30 cm to 3 grams. Compliance 6x10-6. Separation 25 db. Output 16.2 millivolt/channel at 7 cm/1kc. Has 4 terminals and 0.6 mil diamond needle. $34.95.



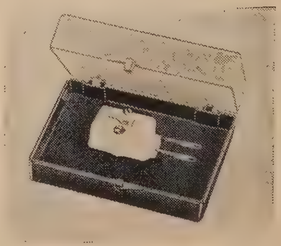
G.E. VR 227

Magnetic stereo cartridge has 20 to 17k cps response ±3 db. Tracking is 5 to 7 grams. Compliance is 2. Separation is 25 db at 1,000 cps. Output is 6 mv/channel at 5 cm/sec. Has 4 terminals and one 0.7 mil diamond needle. $24.95.



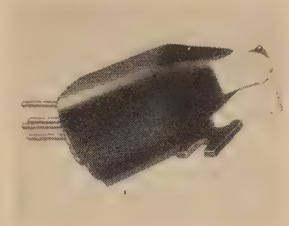
HEATH MF-1

Magnetic cartridge has 20 to 20k cps response ±1 db. Tracking is 2 to 6 grams. Compliance: vertical is 1; horizontal is 2.2. Output is 7 mv/channel at 1 kc. Has 2 terminals and one 0.7 mil diamond needle. For LP monophonic records. $26.95.



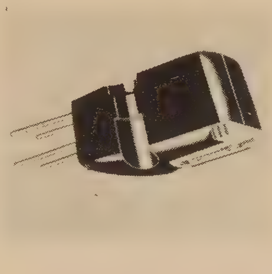
PICKERING 380 A

Collectors' Series stereo cartridge, for use in tone arms, has 15 to 20,000 cps response ±2 db. Tracking is 2 to 5 grams. Compliance is 6. Separation —25 db. Output is 20 mv/channel at 10 cm/sec. Has 4 terminals and yellow "V-Guard" 0.7 mil diamond needle. $34.50. Also, not shown, model 380E. $60.00.



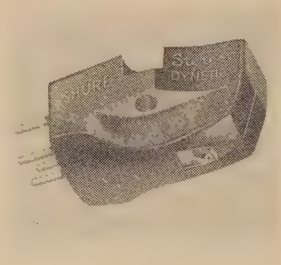
PICKERING 371A MkII

Pro-standard series stereo cartridge has 15 to 15,000 cps response ±2 db. Tracking is 2 to 5 grams. Compliance is 6. Separation —25 db. Output is 20 millivolt/channel at 10 cm/sec. Has 4 terminals and yellow "T-Guard" 0.7 mil diamond needle. $26.40.



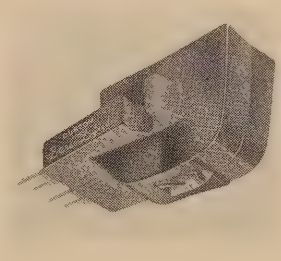
SHURE M3D

Moving magnet type cartridge has 20 to 15,000 cps response ±3 db. Tracking is 3 to 4 grams. Compliance is 4. Separation 20 db plus. 4.5 millivolt/channel at 1,000 cps. Has 3 terminals and 0.7 mil diamond needle. $49.50.



SHURE M7D

Moving magnet type cartridge has 20 to 15,000 cps response. Compliance is 3.5. Separation is 20 db plus. Output is 5 millivolt/channel at 1,000 cps. Has 4 terminals and 0.7 mil diamond needle. $24.00.



ASTATIC 13ATB

Stereo ceramic plug-in turnover cartridge has 30 to 20,000 cps ±3 db response. Tracking is 6 to 8 grams. Compliance 2. Separation 25 db. Output 0.3 v/channel @ 1,000 cps. With 4 terminals and 0.7 and 3.0 mil sapphire needles. Also, 13ATBX with 0.7 mil diamond and 3.0 mil sapphire needles.

COLLARO CSS

Cartridge has 40 to 15,000 cps response ±4 db. Tracking is 4 to 6 grams. Compliance is 2½ vertical; 2 horizontal. Separation 20 db. Output 250 millivolt/channel at 5 cm/sec. Has 4 terminals and 0.7 mil sapphire needle. $9.95. With sapphire/diamond, $18 50.

AUDIOGERSH
Stereotwin 210D

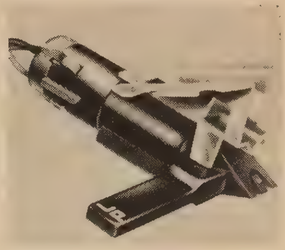
A moving magnet type cartridge with 30 to 18,500 cps ±2 db response. Tracking is 3 to 6 grams. Compliance 4.2. Separation is 22 db at 1,000 cps. Output 13 mv volt/channel @ 10 cm/sec. With 4 terminals and one .7 mil diamond needle. $34.50.

ELECTRO-VOICE 31MD-5

Stereo ceramic cartridge has 20 to 20,000 cps response ± 2 db. Compliance is 3.5. Tracking is 2 to 4 grams. Separation —28 db isolation at 1,000 cycles. Output is 10 mv/channel. Has 4 terminals and 0.5 mil diamond needle. $24.00.

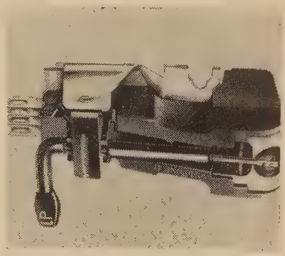
SONOTONE 10T2S

Ceramic cartridge has 20 to 15,000 cps response ±2.5 db. Tracking is 5 to 7 grams. Compliance 1.5. Separation 18 db. Output is .5 volt/channel at 1,000 cps. Has 4 terminals and 2 sapphire needles, 0.7 and 3 mils. $6.45. Also, not shown, 10T2SD $16.50. 10T2SD77 $16.50. 10T2S77 $6.45.



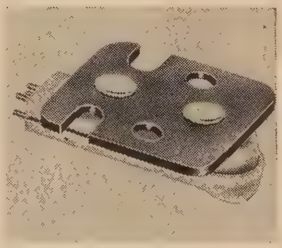
SONOTONE 8TA4S

Ceramic cartridge has 20 to 20,000 cps response ±1.5 db. Tracking is 3 to 6 grams. Compliance 3. Separation 20 db. Output .3 volt/channel at 1,000 cps. Has 4 terminals and 2 sapphire needles, 0.7 and 3 mils. $14.50. Also, not shown, 8TA4SD $19.50. 8TA4D $29.50. 8TA4S77 $14.50.



WEATHERS C-501D

Ceramic cartridge has 15 to 25,000 cps response ±2 db. Tracking is 1 to 2 grams, 3 to 6 grams in changers. Compliance 10. Separation 25 db. Output 15 mv/channel at 1 kc, 5 cm/sec. Has 4 terminals and 0.75 mil diamond needle. $17.50.



ELECTRO-VOICE 21-MD

Stereo ceramic cartridge has 20 to 20,000 cps response ± 2.5 db. Tracking is 5 to 7 grams. Separation: Isolation at 1 kc, 25 db. Output 20 mv/channel. Has 0.7 mil diamond needle. $18.00. Also, model 26-DST turnover cartridge with 0.7 mil diamond needle and 3 mil sapphire needle. $16.50.

PICKERING 380 C

Collector's Series stereo cartridge, for use in changers, has 15 to 20,000 cps response ±2 db. Tracking is 3 to 7 grams. Compliance is 4. Separation —25 db. Output is 20 mv/channel at 10 cm/sec. Has 4 terminals and red "V-Guard" 0.7 mil diamond needle. $29.85. Also available, a 1 mil diamond and a 2.7 mil sapphire.

FAIRCHILD 232

Magnetic cartridge has 20 to 15,000 cps response ±2 db. Tracking is 25 cm to 4 grams. Compliance 6. Separation 25 db. Output 5 millivolt/channel at 7 cm/1kc. as 4 terminals and 0.6 mil diamond needle. $49.95.

SHURE M21

Moving magnet type cartridge has 20 to 20,000 cps response ±2.5 db. Tracking is 1.5 to 2.5 grams. Compliance is over 9. Separation is over 20 db at 1,000 cps. Output is 4.5 millivolt/channel at 1,000 cps. Has 3 terminals and 0.7 mil diamond needle. $49.50.

G.E. VR 225

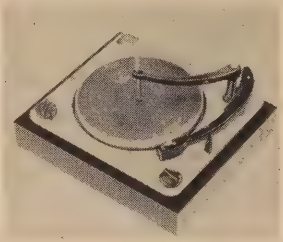
Stereo magnetic cartridge has 20 to 20k cps response ±3 db. Tracking is 2 to 4 grams. Compliance: vertical is 2.5; horizontal is 4. Separation is 25 db at 1,000 cps. Output, 6 mv/channel at 5 cm/sec. Has 4 terminals and one 0.5 mil diamond needle. $27.95.

WEATHERS C-501S

Ceramic cartridge has 15 to 25,000 cps response ±2 db. Tracking is 1 to 2 grams; 3 to 6 grams in changers. Compliance 10. Separation 25 db. Output 15 mv/channel at 1 kc, 5 cm sec. Has 4 terminals and 0.75 mil sapphire needle. $9.75.

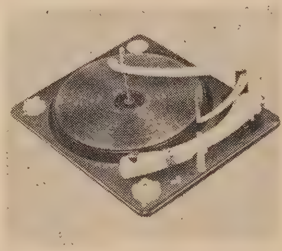
CHANGERS

COLLARO TSC 640



Four-speed record changer. Hum and noise −40 db. Features "sensimagic" feeler to lower arm, 8 second change cycle, 5 terminal head. Wow and flutter ¼%. Has 4 pole motor. $38.50.

GARRARD RC121/11



Four-speed changer has 4-pole dynamically balanced motor and non-resonant die-cast aluminum arm. Hum and noise: —48 db. Wow is 0.18%. Flutter is 0.04%. $42.50 less cartridge. Also, not shown, RC98 $69.50; RC210 $49.50.

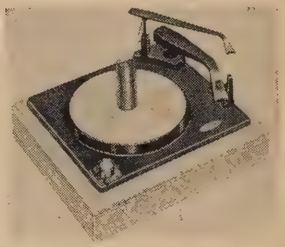
GARRARD RC88

Four-speed changer has 4-pole dynamically balanced motor and non-resonant die-cast aluminum arm. Hum and noise: —52 db. Wow is 0.18%. Flutter is 0.04%. $59.50 less cartridge.

GLASER-STEERS GS-77

Four-speed automatic and manual changer has stereo-monaural switch, damped arm, intermixes all sizes records at any speed and turntable pauses during cycle to let record drop. Flutter 0.12%. Wow 0.2%. 4-pole shielded motor. $59.50 less cartridge.

HEATH RP-3-S

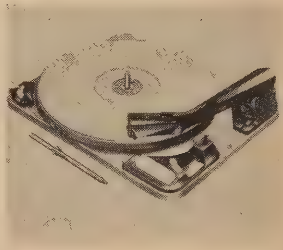


Four-speed changer, with 4-pole hum shielded motor, has wow and flutter of less than 0.18%. Other features include turntable pause during change cycle, and muting switch. $74.95.

STROMBERG-CARLSON PR-488

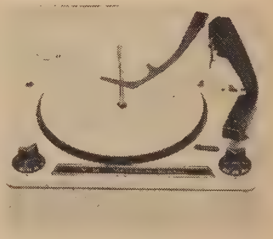
Record changer has 4 speeds and 4-pole induction motor. Wow and flutter is 0.25%. Hum and noise: 45 db. Has automatic speed selector and turntable pause during change cycle. $64.95 without cartridge. $94.95 with cartridge.

UNITED AUDIO Dual-1006



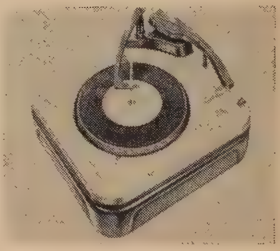
Four-speed record changer with elevator action spindle to intermix any record 5" to over 12", has automatic disengagement of tonearm and speed gears. Wow and flutter 0.1%. Hum and noise =60 db. $69.95. Also, not shown, Dual-1006X, $74.50.

V-M 1202



Record changer has four speeds, 16, 33, 45, and 78 rpm. Wow and flutter, 1/4% RMS. Hum and noise —48 db. Equipped with 4-pole motor. Has plug-in head and magnetic cartridges. $50.00 zone 1. $52.00 zone 2.

WEBCOR 1041 & 1042



Four-speed record changer has wow and flutter of less than 0.55%. Hum and noise: —40 db. Motor: 2 and 4 coil available. Has automatic and manual, jam-proof mechanism; and anti-rumble ribs in mainplate. $55.50 through $83.25.

AUDIOGERSH XS-200

Four-speed automatic and manual changer with push-buttons has rubber matted turntable. Intermixes 10" and 12" records in any sequence. Single play and automatic spindles. $67.50.

COLLARO TSC 840

Four-speed record changer. Hum and noise −40 db. Automatic intermix for 7", 10" and 12" records in any order. 5-pin plug-in head. Double muting switch. Has 4 pole motor. $49.50.

V-M 1201

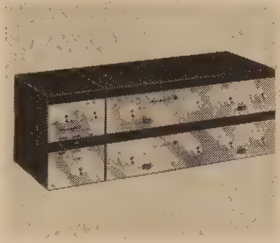
Record changer has four speeds, 16, 33, 45 and 78 rpm. Wow and flutter, 1/4% RMS. Hum and noise —48 db. Equipped with 2-pole motor. $50.00 zone 1. $52.00 zone 2.

WEBCOR 1031

Four-speed record changer has wow and flutter of less than 0.55%. Hum and noise: —40 db. Has 4-pole, 4 coil motor. Also tone arm handle, stylus pressure adjustment on top of tone arm. $75.50 through $83.75.

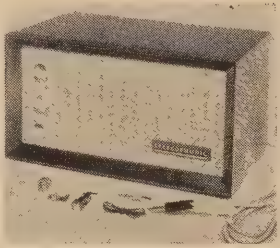
CONVERSION KITS CONTROLS & ADAPTERS

DYNAKIT DSC-1



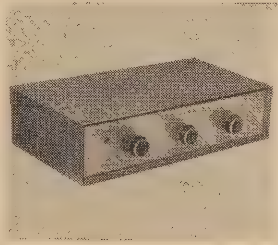
Stereo control unit adds control facilities to pair of preamps. Passive network. 3 controls include volume, balance and blend to fill "hole in middle" by feeding input through both amplifiers. Reverse, loudness & tape switches. Kit $12.95.

FANON STK-10IT



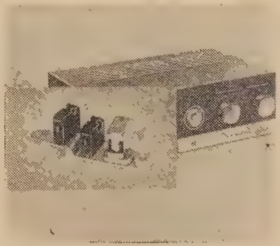
Phono and tape recorder conversion kit to provide second amplifier and speaker for a-c equipment. 3 cabinet finishes. $64.95. Also, not shown, STK-10 to provide second amplifier and speaker for a-c/d-c equipment. $59.95.

FISHER MPX-10



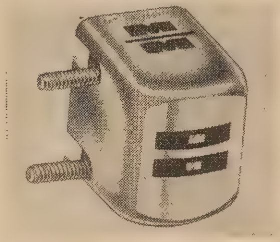
Stereo multiplex adapter provides complete channel balance and separation controls. It prevents stereo cross-talk, and permits standard AM and FM reception when desired without complicated switching. $79.50. Also, not shown, MPX-20 plug-in multiplex adapter for installation directly on the tuner chassis. $49.50.

HEATH MK-4



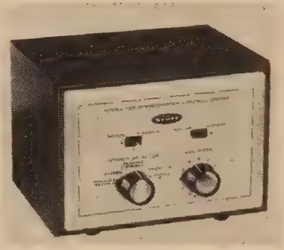
Two-track stereo tape recorder conversion kit to convert Heath model TR-1A to 2-track stereo record plus playback. $62.95. Also, not shown, tape recorder conversion kit, model MK-5, converts TR-1A to 4-track stereo record/playback. $62.95.

MICHIGAN 5Q17



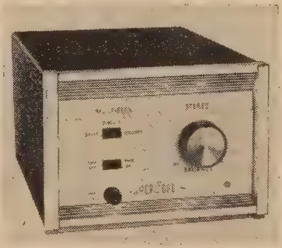
Stereo magnetic record playback head for 4-track 7½ ips or 3¾ ips systems. Response is 50 to 15,000 cps ± 3 db at 3¾ ips. Has 10 kc level −6 db below 1 kc level. Cross-talk −50 db minimum. Pole piece construction assures uniform straight gap. $30.00.

H. H. SCOTT 135



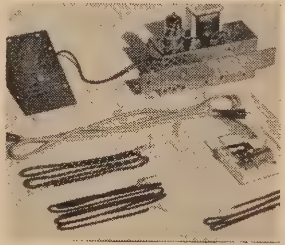
Stereo-Daptor permits simultaneous control of 2 separate amplifiers. Master volume control for both channels. Function selector. Passive circuit. Loudness control. Input 300 k, output 100 k. Reverse stereo. Record-playback switch. $24.95.

SHERWOOD S-MX



FM multiplex adapter is self powered and can be operated with any FM tuner. Has switch for Crosby or split channel. Wide band 22-120 kc. $55.50. Also, not shown, S4MX and S6MX, narrow band 41 Kc and 67 kc respectively. $60.50 each.

WEBCOR A1932



Phono conversion kit whose function is to convert monophonic phonographs to stereo. It requires second channel sound system. $34.95.

AMERICAN 1101 & 1102

Tone arm conversion kits. Model 1101 has 3 ft. cable from tone arm to amplifier. Model 1102 has 6 ft. cable from tone arm to amplifier. $2.15 and $2.50 respectively.

AMPEX 101

4-track stereo playback conversion kit enables owners of Ampex "A" series stereo playback recorders to play the new 4-track 7½ ips stereo tapes, as well as continuing to play 2-track. Includes Ampex 90-millionths magnetic - gap playback head. $50.00 including installation.

BELL BTK-200 & 210

Tape recorder stereo kits which make stereo playback of new ¼-track tapes possible with any Bell stereo tape transport, by the addition of a ¼-track stereo playback. $25.00, $27.50.

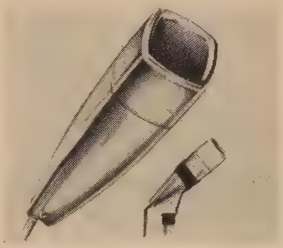
GROMMES 214

Custom stereo preamplfier for converting present hi-fi systems to stereo by adding another power amplifier. 5 inputs/channel. Ganged controls. $87.95. Cover $12.00. Also, model 209 stereo preamplifier. 6 inputs/channel. Special output for stereo recording. $159.95. Cover $12.00.

MICROPHONES

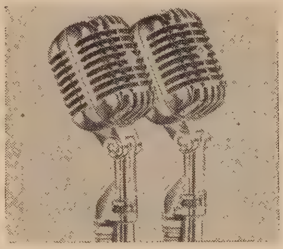
ASTATIC M-332

Semi - directional crystal type microphone has 30 to 15,000 cps ±3 db response. Level is —52 db (1 volt/mb). $17.90.



SHURE 55S

Dynamic, uni-directional, microphone has 50 to 15,000 cps response. Level is —54 db. It reduces pickup of background noises by 73%. Unusually rugged for both indoor and outdoor use. background noises by 73%. Available in matched units for stereo recording. $83.00.



AMERICAN D10T

Omnidirectional dynamic type microphone has 50 to 11,000 cps —55 db response. Level is 1 volt/dyne/cm² db. Other features include an on/off switch, quick slide lock mount and special plastic diaphragm. $33.00.

AMPEX 880

Stereo microphone kit contains 2 dynamic omnidirectional microphones, on-off shorting switch, detachable 8-ft. cable and 2-conductor plug. For use with standard ⅝" thread mounting on floor or desk stand. Includes Stereo-graph "slide-rule" and 16-pg. booklet. $69.95.

SONOTONE CM-10

Ceramic omnidirectional microphone has 15 to 13,000 cps response ±2 db. Level is 62 db below 1.0 volt per microbar. $19.50. Also, not shown, model CM-11 $19.50.

ASTATIC M-150

Semi - directional crystal type microphone has 30 to 10,000 cps ±3 db response. Level is —44 db (1 volt/mb). Size is 2-3/16" x 2 1/4". $6.50.

ELECTRO-VOICE 729S

Cardioid ceramic microphone has 60 to 8,000 cps response. Output level —55 db. Has on-off switch. $26.50. Also, ceramic model 718. Response 60 to 6,000 cps. $12.00.

DUOTONE MIC39-1

Hand, hanging or desk stand crystal microphone has 10 to 10,000 cps response. A die cast microphone liner eliminates hum because of hand capacity. Noise free cable improves screening and signal to noise ratio. Has polar response and is omnidirectional. $20.00 with detachable stand.

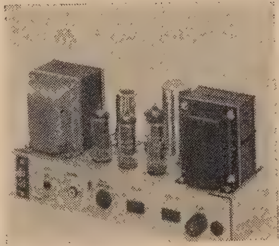
TURNER 204D

Dynamic, omni-directional microphone has 60 to 13,000 cps response. Level is —53 db. Complete with lavalier assembly, desk stand and floor stand adapter. $28.50. Also, Model 80 omnidirectional crystal mike, —53 db, $9.57.

SPEAKERS & ENCLOSURES

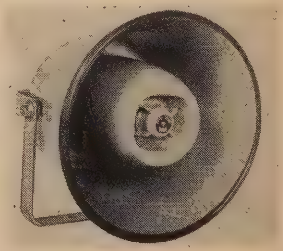
AMPEX 302

Amplifier-speaker system incorporates a 15-watt amplifier 12" bass sound projector and 3" tweeter. Noise and hum 80 db below rated output. Input sensitivity 0.56V. Distortion less than 0.5% at rated output. The amplifier is 5¼" high x 12" long x 3¾" wide and the system's speakers require a 2 cu. ft. enclosure. $174.50.



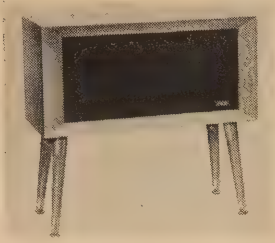
ATLAS WT-6

Outdoor coax-projector speaker comprises weatherproof cone type driver with 6" throat coupled to individual woofer horn. Separate pressure-type driver and tweeter horn. 15 watts. 140 to 15,000 cps response. 8 ohms. 15" bell opening, 12" depth. $34.50.



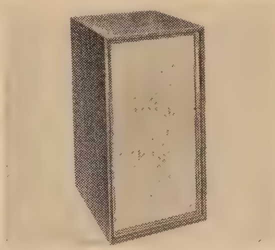
EICO HFS-2

Horn loaded bass, omnidirectional tweeter type speaker incorporates one 8" woofer and one special design cone tweeter. Response is 45 to 20,000 cps ± 5 db. 30 watts. Impedance is 16 ohms. 36" x 15¼" x 11½". $139.95 in genuine finished walnut and mahogany. $144.95 blonde.



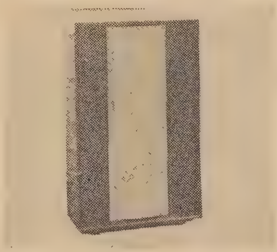
EICO HFS-3

Ducted port bass reflex speaker with one 12" woofer, one 3" mid-range and one 3.5" tweeter. Response is 45 to 14,000 cps ± 5 db. 30 watts. Resonance is 22 cps. Impedance 16 ohms. 13⅞" x 26½" x 14½". $72.50 unfinished birch. $87.95 walnut, mahogany, or teak.



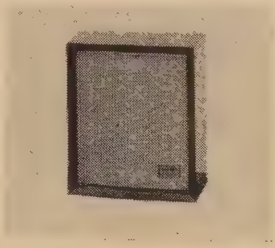
ELECTRO-VOICE Patrician 700

Four-way speaker system has 16 ohms impedance. 54" x 32" x 29". $695.00. Also, not shown, Royal 400, has 30 to 19,000 cps response. Three way. $249.50.



ELECTRO-VOICE Stereon 300

Two-speaker system has 8 ohms impedance. 14" x 11½" x 8⅜". $49.50. Also, Regal 111, three speaker system with 35 to 19,000 cps response. $147.50.

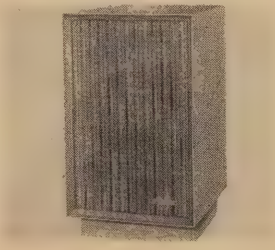


ELECTRO-VOICE Esquire 200

Three-way, low resonance speaker system has 40 to 17,000 cps response. Incorporates one 12" woofer, one 8" cone and one tweeter. Impedance is 8 ohms. 14" x 25" x 13½". $99.50 unfinished. $111.00 finished. Also, not shown, the Leyton two-way speaker. $75.50 unfinished. $84.50 finished.

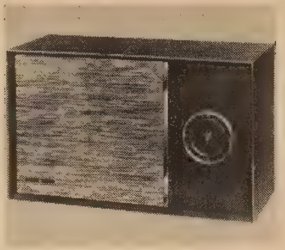
GENERAL ELECTRIC G506

2 cu. ft. extended bass, 12" speaker system has one 12" woofer, one 2" tweeter and crossover network. 40 to 18k cps ±2 db response. 60 watts. Impedance is 8 to 16 ohms. 23¼" x 14½" x 15". Four cabinet finishes. $129.95.



GENERAL ELECTRIC G501

1 cu. ft. extended bass speaker system has one 8" woofer and one 3" tweeter. 45 to 16k cps ±3 db response. 25 watts. Impedance is 8 ohms. 13" x 22" x 9¼". Five cabinet finishes. $85.00.

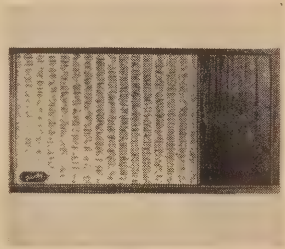


GOODMANS Triaxiom 412

Triaxial cone-tweeter type speaker has 20 to 20,000 cps response. 12" cone speaker. 35 watts. Resonance is 35 cps. Impedance 16 ohms. $92.50. Also, not shown, model Axiom 450, $89.00.

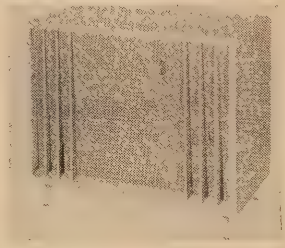
HARTLEY Capri

Full-range, 10" speaker has 40 to 17,000 cps response ±5 db. 20 watts. Resonance is 30 cps. Impedance is 8 ohms. 13½" x 24" x 12". In natural oil-rubbed walnut only. $120.00. Also, not shown, Cameo enclosure. $80.00, three wood finishes. $90.00 in natural woods.



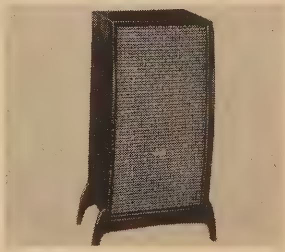
HEATH HH-1

Modified infinite baffle with two 15" Altec low frequency speakers, and one Altec driver with special horn, has 25 to 20,000 cps response ±5 db. 50 watts. 16 ohms impedance. 34" x 41" x 22¾". $299.95.



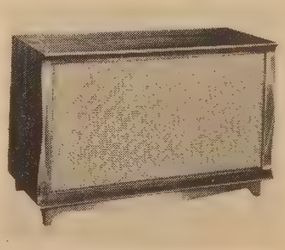
JENSEN GS-2

Dual 3-way stereo speaker system incorporates one 8" bass-center unit, two 6" midranges and two 3½" tweeters. 25 watts maximum music. Response is 36 to 14,000 cps. Resonance 43 cps. Impedance is 16 ohms. Bass: 12½" x 24" x 11⅛". Mid and High: 11½" x 7½" x 4½". $169.50.



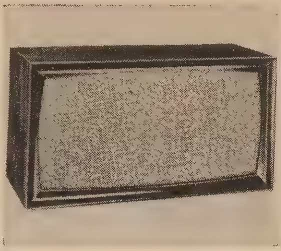
JENSEN TR-10

Bookshelf 3-way speaker system incorporates one 12" H.C. woofer, one 8" midrange and one compression tweeter. Response is 25 to 15,000 cps. 30 watts maximum music. Resonance 20 cps. Impedance is 16 ohms. 13⅞" x 25" x 11⅜". $119.50. Unfinished, in rectangular case, $89.50.



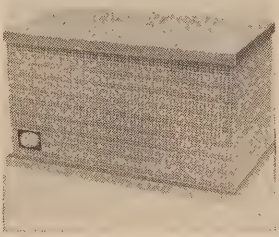
JENSEN DF-1

Bookshelf 2-way speaker system incorporates one 8″ H.C. woofer and one 3½″ tweeter. Response is 36 to 14,000 cps. 25 watts maximum music. Resonance is 43 cps. Impedance is 16 ohms. 12½″ x 24″ x 10½″. $79.50. Unfinished, in rectangular case, $59.50.



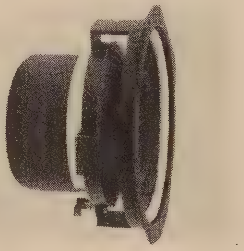
JFD ALC2

Bookshelf speaker has 70 to 15,000 cps response ±5 db. Speaker size, 8″. 12 watts. Resonance is 63 cps. Impedance is 4-8-16 ohms. 14″ x 10″ x 10″. Audiophile $30.00. Also, not shown, model ALC1. 18″ x 10″ x 10″. Audiophile $45.00.



JAMES B. LANSING LE8

Linear efficiency super 8″ full-range speaker has 30 to 17,000 cps response. 20 watts. Impedance is 16 ohms. $57.00. Also, not shown, C46 radial refraction enclosure, $120.

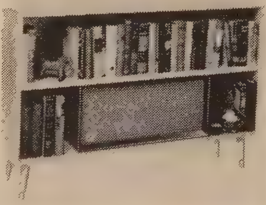


JAMES B. LANSING LE10

Linear efficiency 10″ woofer has 20 to 2,000 cps response. 30 watts. Resonance is 15 cps. Impedance is 16 ohms. $52.80. Also, not shown, LE 30 tweeter, 800 to 2,000 cps, $52.80.

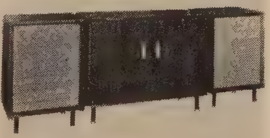
RJ Super 8

Speaker system with 8″ speaker for bookshelf installation. 11″ x 23½″ x 10″. $50.50 unfinished. $59.50 finished. Also, not shown, RJ/8. $28.50 unfinished. $37.50 finished. RJ/12F, $45.00. RJ-12S, $38.50 unfinished. RJ/15, $45.00.



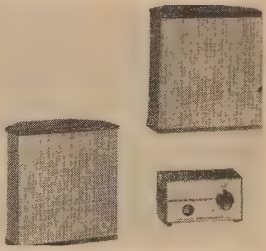
SHERWOOD SM1S

Three-way bass reflex speaker with 300/5000 crossover, has 40 to 13,500 cps response ±4 db. Speaker sizes: 5″, 8″ and 12″. 30 watts. Resonance is 55 cps. Impedance 16 ohms. 29″ x 18″ x 16″. Two finishes. $184.00.



STEPHENS
Stereodot SD101

Three-channel stereo system has one 8″ full range speaker in each enclosure. Response is 250 to 15,000 cps ±5 db. Impedance is 16 ohms. 10½″ x 9½″ x 6″. Three finishes. $139.50. Also, not shown, Brentwood model two-way speaker system, one 8″ woofer and tweeter, $139.50.

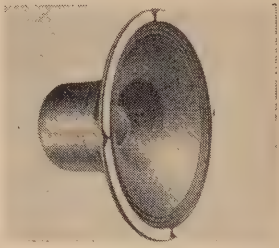


SONOTONE CA-12A

PM coaxial, 40-watt, 12″ speaker has 35 to 20,000 cps response. Resonance is 50 cps. Impedance is 16 ohms. $27.50. Also, not shown, model T-64, 20-watt 4″ x 6″ tweeter. $9.00.

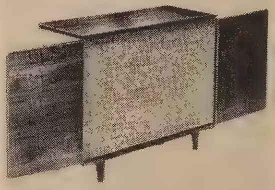
SONOTONE WR-8

PM 8″ wide range speaker has 55 to 15,000 cps response. 20 watts. Resonance is 70 cps. Impedance is 8 ohms. $12.00.



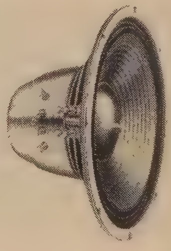
UNIVERSITY TMS-2

Trimensional stereo speaker system has woofer, 2 midranges and 2 tweeters. Response is 30 cps to beyond audibility. Impedance is 8 ohms. 25″ x 30″ x 12½″. $258. In mahogany. All in one cabinet with door to provide stereo "bounce" for walls.



UNIVERSITY C-12SW

Adjustable-response dual voice-coil woofer has 40 to 6,000 cps response. 30 watts. Impedance is 8 ohms. 12½″ wide and 6½″ deep. $39.50.

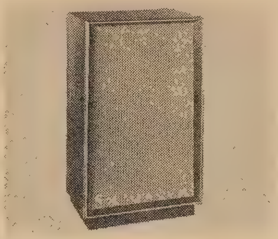


UNIVERSITY RRL-8

Three speaker RRL system, 8″, 30 watts, has a woofer and two tweeters. Response is 40 to beyond audibility. Impedance is 8-16 ohms. 12″ x 22¼″ x 10 5/16″. $99.50 in mahogany. Some wood finishes increase the cost.

WHARFEDALE W/AF/1

A 2-way speaker system in enclosure has a 10" and a 3" speaker, 35 watts. Resonance is 35 cps. Impedance 15 ohms. 30" x 17" x 12". $164.50. Also, not shown: Model W20, 2-way speaker system, 40 watts, $159.50 unfinished; SFB 3 custom 3-way system in sand-filled baffle, 75 watts, $225; SFB/3 DeLuxe 3-way, $279.50.



OXFORD TC8HB

Dual cone, extended range, 8" speaker has 55 to 17,000 cps response ±1 db. 10 plus watts. Resonance is 90 cps. Impedance 8 ohms. $14.00.

WEATHERS Harmony SE-50

Book-sized full-range oval cone speaker, 3" x 10". Response is 70 to 15,000 cps ±3 db. 3 watts. Resonance is 90 cps. Impedance 4 ohms. 11" x 3⅝" x 9 7/32". $29.75. Also, model SE-55, Harmony Bass. 10" woofer cone. $69.50.

ALTEC LANSING 835A Monterey JR.

System has 8" speaker and 1 tweeter. Response is 20 to 18,000 cps. Continuous power is 15 watts. Impedance is 16 ohms. Dimensions are 11¼" high, 23" wide and 11¼" deep. Weight is 45 lbs. $79.50.

CLETRON C33812

Speaker kit has two 3½" tweeters, one 8" mid-range, one 12" woofer and one LC-network. Response is 16 to 18,500 cps ±5 db. 25 watts. Impedance is 16 ohms. $98.00. Also, not shown C8MFR, 12-watt speaker $13.20; C12RW, 25-watter $59.00 and Quartette speaker in enclosure. 25 watts. $158.

STEPHENS 80FR

Free cone full range 8" speaker has 40 to 15,000 cps response ±5 db. 25 watts. Resonance is 40 cps. Impedance 16 ohms. 8 ohm available. $33.50. Also, not shown, model 120FR, 12", 30 watts, $60.00. 150FR, 15", 35 watts, $87.00. 80M, 8", 25 watts, $37.50.

WEATHERS Decorator SE-100

Two-speaker, full range cone system. 3" and 12" speakers. 14 watts. Has 40 to 20,000 cps response ±3 db. Resonance is 45 cps. Impedance 8 ohms. 26" x 32" x 8¾". $135.00. Blond model $139.00.

ARGOS TSE-1S

One 8" woofer and a 3½" tweeter in a ducted type enclosure has 40 to 17,000 cps overall response. Impedance is 8 ohms. Continuous power is 10 watts. Dimensions: 11" high, 24" wide and 10½" deep. Blond or walnut fabric. $24.95. TSE-1 enclosure only, $16.50. Also, not shown, model TSE-1 ducted port enclosure. $16.50.

FISHER XP-1

Speaker system has one 12" woofer and two unlike 5" speakers. Responses is 30 to 15,000 cps. Continuous power: 60 watts of music waveform. Resonance is below 30 cps. Impedance 8 ohms. 13¼" x 24" x 11¼". May be placed on end if desired. $129.50, three cabinet finishes. $124.50, unfinished birch.

UTAH C12RD

Stereo woofer, 12", 30 watts, has 20 to 25,000 cps response ±3 db. Resonance is 35 cps. Impedance 16 ohms, 8 ohms each section. $75.00. Also, not shown, D12LA 12" coaxial full range speaker $29.95.

WELLCOR E-1

Enclosure accommodates changer or turntable, tuner, and amplifier. Portable tape recorder mounts on slide-out shelf. Ample record storage and tape storage. Turntable compartment is top loaded, has all-position lid support. Hinged doors have magnetic catches. $157.50 mahogany. $172.50 limed oak or walnut.

CHANNEL MASTER 6630

PM type speaker, 8", has 40 to 16,000 cps response ±3 db. Resonance is 120-150 cps. Impedance 4 ohms. Available in 3 colors in models 6630, 6631, 6632. $29.95.

OXFORD BR-1M

Base reflex speaker system has one 3", one 8" and one 12" speaker. Response is 35 to 15,000 cps. ±1 db. 20 watts. Impedance is 8 ohms. 23¾" x 33⅜" x 17". Four finishes. $111 to $118.

UTAH SS102

Bookshelf—infinite baffle type speaker system has one 8" and one 5" speaker. 10 watts. Impedance is 8 ohms. 10" x 20" x 10¼". $63.50. Also, not shown, GMT8J, 8" mid-range tweeter. $17.95.

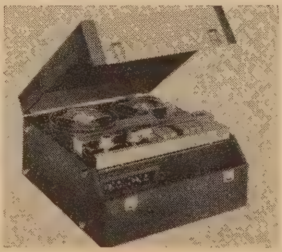
WHARFEDALE WS/2

A full-range 2-way speaker system with one 3" and one 8" speaker has 20 watts power, 35 cps resonance and the impedance is 12-16 ohms. $79.50 unfinished. Also, not shown: Model Super 3, a 3" speaker, $26.50; W/12/FS, a 12" low frequency driver, $52.50; W/15/FS, a 15" driver, $89.50.

TAPE RECORDERS

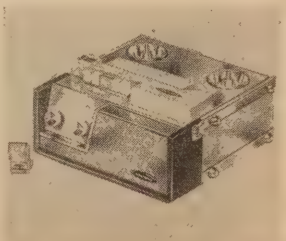
BELL T-218/RP-120

Tape transport (T-218) with 2 RP-120 record playback preamps, has speeds of 3¾ and 7½ ips. Response is 25 to 12,000 cps ±2 db @ 7½ ips. Signal to noise is 50 db ½ 7½ ips. Wow and flutter 0.2%. $314.95.

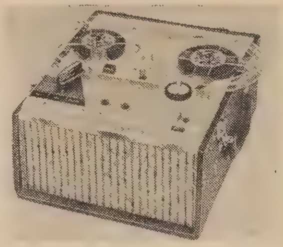


PENTRON XP-605

Stereo tape recorder has 7½ and 3¾ ips speeds. Response is 40 to 15,000 cps ±3 db at 7½ ips. Signal to noise is 50 db at 7½ ips. Wow and flutter 0.3%. It is push-button operated, and has automatic shut-off. Weight is 18 pounds. $249.95.

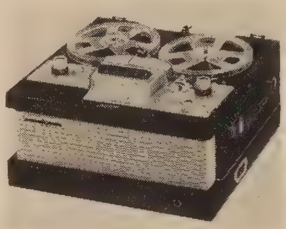


TELECTROSONIC 1975



Tape recorder for monophonic recording and stereo or monophonic playback incorporates a 4-track stereo record/playback head. Response: 7½ ips 100 to 12,000 cps; 3¾" ips 100 to 7,500 cps. Wow and flutter less than 0.3% at 7½ ips, 0.35% at 3¾" ips. $119.95.

V-M 720



Two-speed tape recorder, 7½ and 3¾ ips, has 40 to 15,000 cps response ±5 db at 7½ ips. Signal to noise better than —45 db at 7½ ips. Wow and flutter less than 0.4%. Has 4 track and stereo playback. Add-a-track. Push-button controls. $225.00, zone 1. $229.95 zone 2.

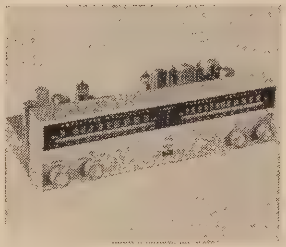
AMERICAN-CONCERTONE 33

Dual speed tape recorder and playback unit has speeds of 3¾-7½ or 7½-15 ips. Response is 40 to 15,000 cps ±2 db @ 15 ips. Signal to noise is 55 db @ 15 ips. Wow and flutter is 0.1% or less. Maximum of 5 heads. $995.00.

AMPEX 960

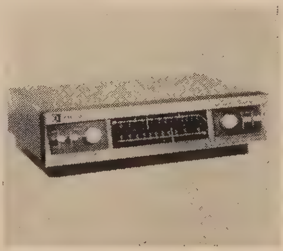
Portable stereo recorder/reproducer has 3¾ and 7½ ips speeds. Response is 50 to 15,000 cps ±2 db @ 7½ ips. Signal to noise is 55 db @ 7½ ips. Wow and flutter is under 0.2% RMS. It records stereo and plays both 2-track and 4-track stereo. $650.00.

ARKAY ST-11



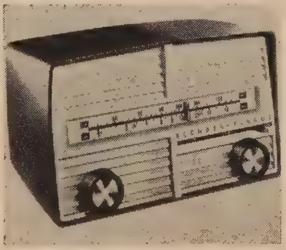
Tuner provides simultaneous FM/AM reception. FM sensitivity 4 μv for 20 db quieting. Hum —65 db. 20 to 20,000 cps ±0.5 db. Distortion 1%. Selectivity 200 kc 6 db down. $49.95 kit. $74.50 wired. Also, not shown, FM-8 tuner, $39.95 kit. $59.95 wired.

BELL 6070



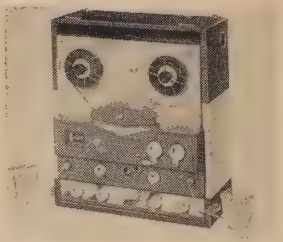
FM/AM stereo tuner has response of 20 to 20,000 cps ±0.5 db. Sensitivity 1.1 μv at 20 db quieting at 100% modulation. Hum is 60 db below 100% modulation. Harmonic distortion is less than 1.0%. Features include separate tuning meters, dual AM selectivity and cathode follower outputs. $189.95.

BLONDER-TONGUE T-88



FM/AM tuner has 10 to 15,000 cps response ±0.5 db. Sensitivity is 4 μv at 20 db quieting. Hum is 60 db, 1.50% IM. Harmonic distortion 0.6%. Drift-free tuning. $45.50.

WEBCOR 2007



Three-speed tape recorder, 7½, 3¾, 1⅞ ips, has 50 to 15,000 cps response. Signal to noise: 45 db at 7½ ips. Wow and flutter 0.4%. Has stereo record playback, 2-track and 4-track compatible, volume unit meter. $288.47.

HEATH TR-1D

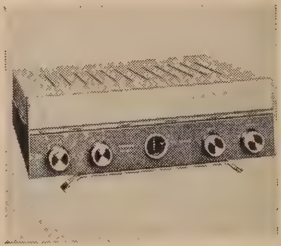
Tape recorder, with 7.5 and 3.75 ips speeds, has 30 to 12,000 cps response ±2.5 db at 7.5 ips. Signal to noise is —50 db at 7.5 ips. Wow and flutter 0.3%. Has complete mechanism, circuit board construction of tape amplifier and ½ track stereo head array. $169.95.

ROBERTS 90-C

Stereo tape recorder has speeds of 3¾ and 7½ ips. Response is 40 to 15,000 cps ±2 db at 7½ ips. Signal to noise: 50 db. Wow and flutter: 0.25%. Portable with built-in speaker. 15 ips bushing available. 2-track head has adjustable full or half track erase. $349.50, 2-track. $359.50, 4-track.

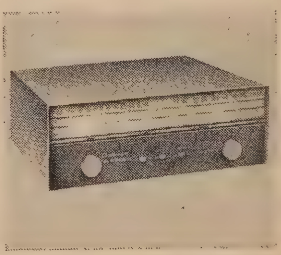
TUNERS

BOGEN ST442



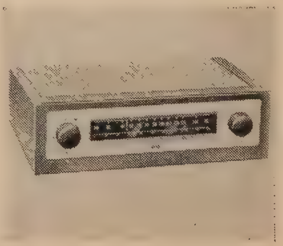
FM/AM tuner has FM sensitivity of 1.5 μv at 30 db quieting at 75 ohm input; 3.0 μv at 30 quieting at 300 ohm input. Response is FM: 20 to 18,000 cps ±0.5 db; AM: 20 to 4,500 cps ±1.50 db. $149.50.

BOGEN TC322



FM/AM tuner has FM sensitivity of 5 μv at 30 db quieting at 300 ohm input. Response: FM, 20 to 15,000 cps ±1 db; AM, 20 to 3,500 cps ±1.50 db. $109.50 including enclosure.

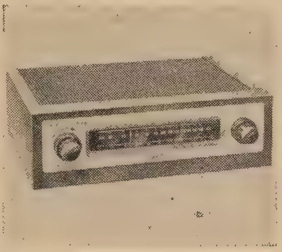
EICO HFT-90



FM tuner with traveling neon indicator has 20 to 20,000 cps response ±1 db. Sensitivity 1.5 μv at 20 db quieting. Hum —60 db. Harmonic distortion 1%. $39.95 kit. $65.95 wired. Less cover. Optional cover $3.95.

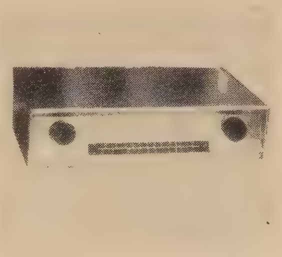
EICO HFT-94

AM tuner with traveling neon indicator and 10 kc whistle filter. Response, wide band, 20 to 9,000 cps +0, —3 db; narrow band, 20 to 5,000 cps +0, —3 db. Hum —60 db. Harmonic distortion is 1% at 100% modulation. $39.95 kit. $69.95 wired. Includes cover.



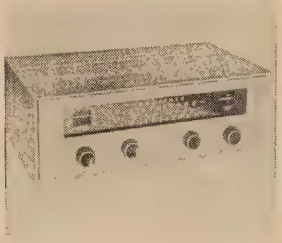
ERIE EM-085-ER

FM/AM tuner has etched wiring board, Erie PAC, 2 i-f stages, and Foster-Seeley discriminator circuit. Sensitivity is 10 μv at 30 db quieting. Hum is —35 db. $84.50.



FISHER 101R

Stereo FM/AM tuner has 20 to 20,000 cps response ±1 db. Sensitivity 0.75 μv at 20 db quieting. Inaudible hum. Signal to noise: 60 db for 100 μv input. Harmonic distortion is less than 0.5% at full modulation. $229.50.

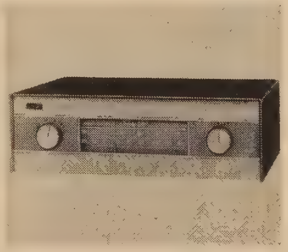


FISHER 600

Stereo FM/AM tuner with dual preamps and amps. Response is 25 to 20,000 cps ±1 db. Sensitivity 2 μv at 20 db quieting. Hum is 90 db. IM 1.5%. Harmonic distortion less than 0.5%. Has 20 watts/channel amplifier. $349.50. Also, not shown, model FM-100 FM tuner. $159.50.

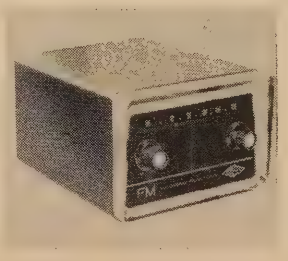
GENERAL ELECTRIC FA 15-16-17

FM/AM tuner with amplifier has 30 to 15,000 cps response ±2 db. Sensitivity is 2.5 μv at 20 db quieting. Hum is 55 db. IM is below 1%. Harmonic distortion is maximum 1.5%. Has tuning meter and multiplex jack. Cases match amplifiers. $129.95.



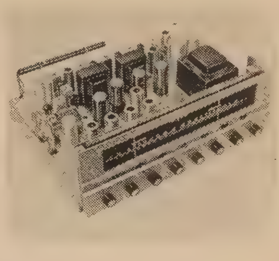
GONSET 3311

FM tuner for autos has high sensitivity, afc, hybrid circuitry, and covers 88-108 mc FM band. For use with 12-volt negative-grounded batteries; can be adapted for 12-volt positive-grounded batteries. Plugs into the car's AM radio. Chromium trim. $99.50.



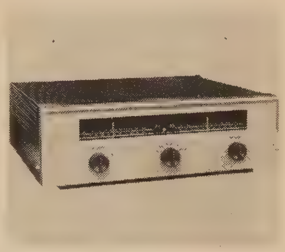
HARMAN-KARDON TA230

Stereo AM/FM tuner, with preamp and amplifier, has 20 to 20,000 cps response ±1 db. Sensitivity is 2.5 μv at 20 db quieting. Hum is 70 db. IM is less than 1%. Harmonic distortion 0.6%. Amplifier is 15 watts/channel. Has illuminated push-button on/off switch, phasing switch and dual clutch tone controls. $259.95.



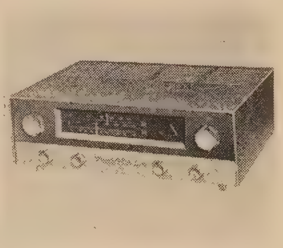
HARMAN-KARDON T230

Stereo AM/FM tuner has 20 to 20,000 cps response ±1 db. Sensitivity is 2.5 μv at 20 db quieting. IM is less than 1% at 30% modulation. Has multiplex output receptacle and flywheel tuning. $114.95. Also, not shown, AM/FM tuner ST 360 with multiplex adapter MA-350, $199.95.



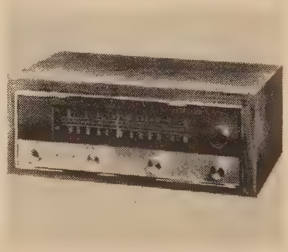
HEATH PT-1

FM/AM tuner has 20 to 20,000 cps response ±2 db. Sensitivity is 2 μv at 20 db. quieting. Hum is —40 db. IM less than 1%. Harmonic distortion less than 1%. Other features include: afc, prebuilt tuning unit, tuning meter, separate AM and FM circuits for stereo applications. $89.95.



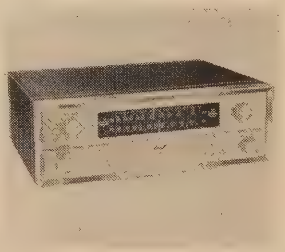
McINTOSH MR55A

FM/AM tuner has 20 to 20,000 cps response ±3.0 db. Sensitivity 1.5 microvolts at IHFM measurements. Hum is —70 db. Has ultrasonic muting, an exclusive feature; and strong afc. $249.00.



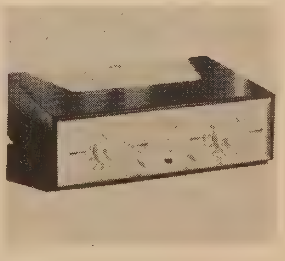
PILOT 580

Stereo FM/AM tuner has independent FM and AM sections for individual or simultaneous use. FM sensitivity: 1.5 μv. AM sensitivity: 3 μv. $179.50.



H. H. SCOTT 330D

FM/AM stereo tuner has 20 to 20,000 cps response ±1 db. Features include agc, two limiting stages, 2 mc wide-band FM detector, FM level control to match amplifier input. $224.95.



SHERWOOD S-2200

FM/AM multiplex stereo tuner has 20 to 20,000 cps response ±0.5 db. Sensitivity is 0.95 µv at 20 db quieting. Hum is —60 db. IM 0.333% at 100. Harmonic distortion is 0.25% at 100. Multiplex can be added internally. $179.50. Also, not shown, S-2000 II FM/AM tuner, $145.50.

CHANNEL MASTER 6610

FM/AM tuner has 20 to 20,000 cps response ±1 db. Sensitivity is 2½ µv at 20 db quieting. IM is 2%. Other features include avc, afc, multiplex output jack. $79.95.

DE WALD N-1000-B

Stereo Hi-Fi AM/FM tuner has 20 to 20,000 cps response ±1 db. Sensitivity is 3 µv at 20 db quieting. Hum —70 db. Full afc and defeat. Facilities for direct tape recording. Multiplex outlet. $99.95. Also, N-803-B FM/AM tuner, $77.95; N-804-B FM tuner, $74.95.

GROMMES 103GT

FM/AM stereo tuner has FM sensitivity better than 1 µv at 20 db quieting; AM 3 µv. Harmonic distortion: FM 25% at 100% modulation; AM 2% or less. Circuit has grounded grid input, afc, dual limiters and broad band Foster Seeley discriminator. $189.95. Also, not shown, 102GTA, $119.95.

PACO ST-45

FM/AM tuner has 20 to 20,000 cps response ±0.5 db. Sensitivity is 2 µv at 30 db quieting. Hum is 60 db below 100% modulation. IM less than 0.3%. Prices for both wired and kit to be announced.

TURNTABLES

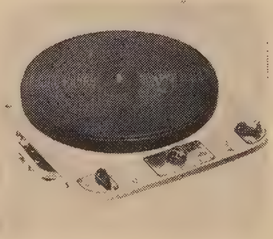
BOGEN B60

Four-speed turntable has 11¾" precision steel turntable. Wow and flutter are less than 0.25% at 33 1/3 rpm. Equipped with four-pole, heavy duty, constant-velocity motor. $49.95.

FAIRCHILD 412-1

Turntable with one speed (33 rpm) has hysteresis synchronous motor. Hum and noise: —65 db. Wow and flutter: 0.1%. Other features include double belt drive. Low vertical and lateral rumble. $79.50.

GARRARD 301

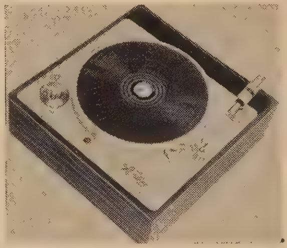


Three-speed turntable has 4-pole motor suspended by isolation springs. Noise —56 db. Wow 0.15%. Flutter 0.03%. 6.5 lb. dynamically balanced cast aluminum turntable. $89.00.

PICKERING 800

Gyropoise stereotable, 33 1/3 speed, with synchronous motor. Hum and noise: —65 db. Wow is 0.2%. Flutter 0.1%. It is suspended magnetically to eliminate vertical rumble. Minimum mounting requirements: 14½"x14½". $59.85.

REK-O-KUT B-12H

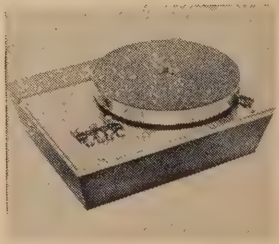


Turntable with three speeds: 33 1/3, 45 and 78. Has heavy duty hysteresis synchronous motor. Hum and noise: —57 db. Wow is 0.14% RMS. Flutter 0.07% RMS. Has internal rim drive. $129.95. Also, not shown, model B-12GH three-speed turntable. $99.95.

REK-O-KUT K-33

Single-speed 33 1/3 rpm turntable has induction 4 pole motor. Hum and noise: —47 db. Wow 0.17% RMS. Flutter 0.13% RMS. $39.95 kit. K-33H with hysteresis synchronous motor, $49.95 kit. Also, not shown, N-33H @ $69.95; L-34 2-speed @ $59.95.

H. H. SCOTT 710-A



Three-speed turntable has each speed range adjustable by ±5%. Expanded scale optical strobe. Rumble —60 db. Wow and flutter 0.1%. Machined aluminum casting table. Slip clutch for cueing. Induction motor. Helical drive gears in oil transmission. $129.95.

STROMBERG-CARLSON PR-499

Dual, belt driven turntable with continuously variable speeds, has induction motor. Hum and noise: 55 db. Wow is 0.14%. Flutter is 0.09%. Arm and table are mounted together and suspended from board. Motor is suspended separately. $99.95.

WEATHERS ML-1

One-speed turntable, 33.3, has synchronous motor. Hum and noise: —70 db NARTB. Wow is 0.15%. Flutter 0.10%. "Discushion" mat contacts disc only at outer edge. Slow-speed drive motor puts rumble at 15 cps. $49.95. An electronic speed control unit, @ $74.50, gives four-speed operation.

STEREO BUYERS DIRECTORY

Manufacturers grouped in 10 product categories

1—AMPLIFIERS & CONTROL UNITS

Amplifiers, 1-channel	**1**
Amplifiers, 2-channel	**2**
Control Units, stereo	**3**

Acro Products Co., 369 Shurs Lane, Philadelphia 28, Pa.—1-2.
Affiliated Television Labs., Inc., 112-07 Francis Lewis Blvd., Queens Village 29, N. Y.—1-2
Allied Radio Corp., 100 N. Western Ave., Chicago 80, Ill.—1-2-3
Altec Lansing, 1515 S. Manchester St., Anaheim, Calif.—1-2-3
Ampex Audio, 1020 Kifer Rd., Sunnyvale, Calif. 1-3
Arkay Electronics, Inc., 88-06 Van Wyck Expressway, Jamaica 18, N. Y.—1-2
Autocrat Electronics Co., 5024 Elm St., Skokie, Ill.—1-2

Bell Sound Div., 555 Marion Rd., Columbus 7, Ohio—2
Blonder-Tongue Laboratories, Inc., 9 Alling St., Newark 2, N. J.—1
Bogen-Presto Co., P. O. Box 500, Paramus, N. J.—1-2-3

Channel Master Corp., Ellenville, N. Y.—1-2
Continental Mfg., Inc., 1612 California St., Omaha 2, Nebr.—1-2

DeRo Electronics, 10 Woods Ave., Roosevelt, L. I., N. Y.—3
DeWald Radio, Div. United Scientific Labs., 35-15 37 Ave., Long Island City 1, N. Y.—1-2
Dynaco Inc., 617 N. 41 St., Philadelphia 4, Pa.—1-2-3
Dynamic Electronics-New York Inc., 87-46 123 St., Richmond Hill, N. Y.—1-2

Electron Enterprises Inc., 6917-21 Stanley Ave., Berwyn, Ill.—1-2
Electronic Applications, Inc., 194 Richmond Hill Ave., Stamford, Conn.—1-2
Electronic Development Associates, 125 E. 46 St., New York 17, N. Y.—1-2
Electronic Instrument Co. (EICO) 33-00 Northern Blvd., Long Island City, N. Y.—1-2
Ercona Corp., 16 W. 46 St., New York 36, N.Y.—1-2
Erie Resistor Corp., 644 W. 12 St., Erie 6, Pa. —1

Fairchild Recording Equipment Corp., 10-40 45 Ave., Long Island City 1, N. Y.—1-3
Fedtro Inc., Federal Electronics Sales Div., Federal Electronics Bldg., Rockville Centre, L. I., N. Y.—3
Fidelity Amplifier Co., 1633 N. Halsted St., Chicago 14, Ill.—1-2
Fisher Radio Corp., 2121-44th Dr., Long Island City 1, N. Y.—2-3

General Electric Co., Audio Components Section, 1285 Boston Ave., Bridgeport 2, Conn. —2-3
Greene Co., L. Charlton, 314 Washington St., Newton 58, Mass.—1

Harman-Kardon, Inc., 520 Main St., Westbury, L. I., N. Y.—2
Heath Co., Benton Harbor, Mich.—1-2-3

Intelex Systems Inc., 22 Thames St., New York 6, N. Y.—2

LaBelle Industries, 510 S. Worthington St., Oconomowoc, Wis.—1-2
Lafayette Radio, 165-08 Liberty Ave., Jamaica 33, N. Y.—1-2-3
Leak Div., British Industries Corp., 80 Shore Rd., Port Washington, N. Y.—1-2
Lesa of America, 11 W. 42 St., New York 36, N. Y.—1

McIntosh Laboratory Inc., 2 Chambers St., Binghamton, N. Y.—1-3
Magnecord Div., Midwestern Instruments Inc., 41st. & Sheridan Rd., Tulsa 5, Okla.—1-2
Marantz Co., 25-14 Broadway, Long Island City 6, N. Y.—1-3
MP Eng'g. Co., Fairfield 3, Conn.—1-2-3

Newcomb Audio Products Co., 6824 Lexington Ave., Hollywood 38, Calif.—2
Nortronics Co., 1015 S. 6 St., Minneapolis 4, Minn.—1-2

Paco Electronics Co., 70-31 84 St., Glendale 27, L. I., N. Y.—2
Permoflux Products Co., 4101 San Fernando Rd., Glendale 4, Calif.—1-2
Pilot Radio Corp., 37-06 36 St., Long Island City 1, N. Y.—1-2-3
Precision Electronics Inc., (Grommes) 9101 King St., Franklin Park, Ill.—1-2-3

Regency Div., IDEA Inc., 7900 Pendleton Pike, Indianapolis, Ind.—1

Sargent-Rayment Co., 4926 E. 12 St., Oakland 1, Calif.—1-2-3
Scott Inc., H. H., 111 Powder Mill Rd., Maynard, Mass.—1-2-3
Setchell-Carlson, Inc., New Brighton, St. Paul 12, Minn.—2
Shell Electronics Mfg. Corp., 112 State St., Westbury, N. Y.—2
Sherwood Electronic Labs., Inc., 4300 N. California Ave., Chicago 18, Ill.—1-2
Simpson Mfg. Co., Mark, 32-28 49 St., Long Island City 3, N. Y.—1-2
Sonic Industries, 19 Wilbur St., Lynbrook, N. Y.—2
Stromberg-Carlson, 1400 N. Goodman, Rochester, N. Y.—1-2
Switchcraft, Inc., 5555 N. Elston Ave., Chicago 30, Ill.—1

Vidaire Electronics Mfg. Corp., 44 Church St., Baldwin, N. Y.—3

Waber Electronics, 105 Heatherwood Rd., Havertown, Pa.—2-3
Weathers Industries, Div. Advance Industries, Inc., 66 E. Gloucester Pike, Barrington, N. J. —1-2-3
Webcor, Inc., 5610 Bloomingdale, Chicago 39, Ill.—3
Wells-Gardner & Co., 2701 N. Kildare Ave., Chicago 39, Ill.—1-2-3
Whitley Electronics, Inc., 43 S. Main St., Andrews, Ind.—1-2-3

2—CARTRIDGES, STEREO PHONO

Admiral Corp., 3800 Cortland St., Chicago 47, Ill.
Allied Radio Corp., 100 N. Western Ave., Chicago 80, Ill.
American Microphone Mfg. Co., 412 S. Wyman St., Rockford, Ill.
Argonne Electronics Mfg. Corp., 165-11 South Rd., Jamaica 33, N. Y.
Astatic Corp., Conneaut, Ohio
Audio-Empire, Div. Dyna-Empire, Inc., 1075 Stewart Ave., Garden City, N. Y.
Audiogersh Corp., 514 Broadway, New York 12, N. Y.

Berger Communications, 109-01 72nd Rd., Forest Hills 75, N. Y.

CBS Electronics, Div. Columbia Broadcasting System, Inc., 100 Endicott St., Danvers, Mass.

Duotone Co., Locust St., Keyport, N. J.
Dynaco Inc., 617 N. 41 St., Philadelphia 4, Pa.

Electronic Applications, Inc., 194 Richmond Hill Ave., Stamford, Conn.
Electro-Sonic Labs., Inc., 35-54 36 St., Long Island City 6, N. Y.
Electro-Voice, Inc., Cecil & Carroll St., Buchanan, Mich.
Ercona Corp., 16 W. 46 St., New York 36, N. Y.
Erie Resistor Corp., 644 W. 12 St., Erie 6, Pa.

Fairchild Recording Equipment Corp., 10-40 45 Ave., Long Island City 1, N. Y.
Fedtro Inc., Federal Electronics Sales Div., Federal Electronics Bldg., Rockville Centre, L. I., N. Y.
Fen-Tone Corp., 106 5 Ave., New York 11, N. Y.

General Electric Co., Audio Components Section 1285 Boston Ave., Bridgeport 2, Conn.
Gulton Industries, 212 Durham Ave., Metuchen, N. J.

Heath Co., Benton Harbor, Mich.

Int'l. Pacific Recording Corp., 6906 Santa Monica Blvd., Hollywood 38, Calif.

Lafayette Radio, 165-08 Liberty Ave., Jamaica 33, N. Y.
Lesa of America, 11 W. 42 St., New York 36, N. Y.

Pickering & Co., Sunnyside Blvd., Plainview, L. I., N. Y.

Radio Music Co., 84 S. Water St., Port Chester, N. Y.
Rockbar Corp. (Collaro), 650 Halstead Ave., Mamaroneck, N. Y.

Scott Inc., H. H., 111 Powder Mill Rd., Maynard, Mass.
Shure Bros., Inc., 222 Hartrey Ave., Evanston, Ill.
Sonotone Corp., Box 200, Elmsford, N. Y.

Tannoy (America) Ltd., P. O. Box 177, E. Norwich, N. Y.

United Audio Products, Inc., 202 E. 19 St., New York 3, N. Y.

Weathers Industries, Div. Advance Industries, Inc., 66 E. Gloucester Pike, Barrington, N. J.

3—CHANGERS, TURNTABLES & ARMS

Arms	**1**
Changers	**2**
Turntables	**3**

Admiral Corp., 3800 Cortland St., Chicago 47, Ill.—2
Argonne Electronics Mfg. Corp., 165-11 South Rd., Jamaica 33, N. Y.—1-3
Astatic Corp., Conneaut, Ohio—1
Audio-Empire, Div. Dyna-Empire, Inc., 1075 Stewart Ave., Garden City, N. Y.—1-3
Audiogersh Corp., 514 Broadway, New York 12, N. Y.—2

Bard Record Co., 66 Mechanic St., New Rochelle, N. Y.—1
Bogen-Presto Co., P.O. Box 500, Paramus, N. J. —1-3

Channel Master Corp., Ellenville, N. Y.—3

Duotone Co., Locust St., Keyport, N. J.—1
Dynaco Inc., 617 N. 41 St., Philadelphia 4, Pa.—1

Electronic Applications, Inc., 194 Richmond Hill Ave., Stamford, Conn.—1-3
Electro-Sonic Labs., Inc., 35-54 36 St., Long Island City 6, N. Y.—1
Ercona Corp., 16 W. 46 St., New York 36, N. Y.—1-2-3

Fairchild Recording Equipment Corp., 10-40 45 Ave., Long Island City 1, N. Y.—1-3
Fedtro Inc., Federal Electronics Sales Div., Federal Electronics Bldg., Rockville Centre, L. I., N. Y.—1
Fen-Tone Corp., 106 5 Ave., New York 11, N. Y.—2

Garrard Sales Corp., 80 Shore Rd., Port Washington, N. Y.—1-2-3
General Electric Co., Audio Components Section, 1285 Boston Ave., Bridgeport 2, Conn. —1
Glaser-Steers Corp., 155 Oraton St., Newark 4, N. J.—2
Gray High Fidelity Div., 16 Arbor St., Hartford 1, Conn.—1-3

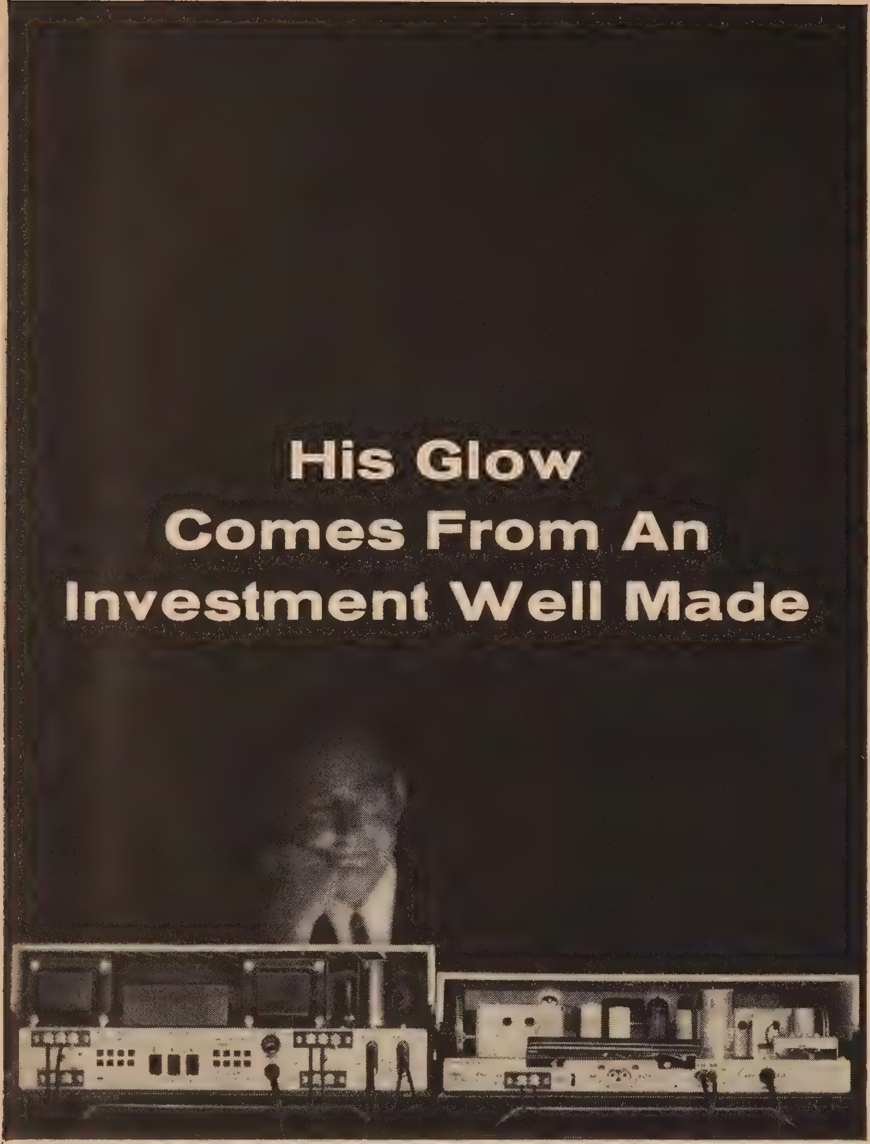
Heath Co., Benton Harbor, Mich.—2

Int'l. Pacific Recording Corp., 6906 Santa Monica Blvd., Hollywod 38, Calif.—3

Lafayette Radio, 165-08 Liberty Ave., Jamaica 33, N. Y.—1-2-3
Lesa of America, 11 W. 42 St., New York 36, N. Y.—2-3

North American Philips Co., 230 Duffy Ave., Hicksville, L. I., N. Y.—2

Orthro-Sonic Instruments, Inc., 66 Mechanic St., New Rochelle, N. Y.—1



EXCITED, CONFIDENT, PROUD. He started his stereo system with the Bogen DB230A Stereo Control Center and ST662 Stereo Tuner. He's set for the future.

The choice was easy...once all the facts were in. First, he learned that Bogen has the experience. That's because Bogen has a larger engineering staff...has made more sound equipment than any other hi-fi manufacturer.

Next, he compared prices. Found out he'd have to pay as much as $50 more for components with power, sensitivity and versatility to compare with Bogen's.

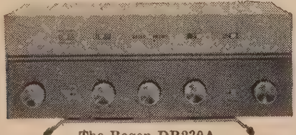
Then he listened. Incomparable!

Finally, the most exacting test of all... his wife's opinion. Not only did wife like Bogen's clean styling, she was amazed to discover how easy it is to use the complete, yet uncomplicated controls.

That did it. Our friend took the DB230A and ST662 home with him. The glow hasn't worn off.

And it won't for you, either. Get the Bogen glow today...at your hi-fi dealer.

Write for information to:
BOGEN-PRESTO CO., Paramus, N. J.
A Division of the Siegler Corporation


The Bogen DB230A

HIGH FIDELITY

BOGEN

the sound way to better stereo

DB230A. Output Power: 60 watts (two 30-watt channels). Distortion: less than 1% at 60 watts. Response: 20 to 20,000 cycles ±0.5 db. Controls: Input Selector, Loudness, Lo Filter, Hi Filter, Stereo-Monophonic, Balance, Power, Phasing, Cartridge (Stereo, Mono), Speaker Selector and separate Bass, Treble and Volume for each channel. Price: $189.50. Enclosure and legs: $8.00. **ST662.** Companion Stereo FM-AM Tuner with built-in provision for Multiplex. $189.50.

Pickering & Co., Sunnyside Blvd., Plainview, L. I., N. Y.—1-3

Radio Music Co., 84 S. Water St., Port Chester, N. Y.—1-3
Recordio Corp., 603 W. Seminary, Charlotte, Mich.—3
Rek-O-Kut Co., 38-19 108 St., Corona 68, N. Y.—1-3
Rockbar Corp., (Collaro) 650 Halstead Ave., Mamaroneck, N. Y.—2-3

Scott Inc., H. H., 111 Powder Mill Rd., Maynard, Mass.—1-3
Shure Bros., Inc., 222 Hartrey Ave., Evanston, Ill.—1
Smolin Labs., Woodbrook Drive, Springdale, Conn.—2
Stromberg-Carlson, 1400 N. Goodman, Rochester, N. Y.—1-3

Thorens Co., Thorens Ave., New Hyde Park, N. Y.—2-3

United Audio Products, Inc., 202 E. 19 St., New York 3, N. Y.—2-3

V-M Corp., 305 Territorial, Benton Harbor, Mich.—2

Weathers Industries, Div. Advance Industries, Inc., 66 E. Gloucester Pike, Barrington, N. J.—1-3
Webcor, Inc., 5610 Bloomingdale, Chicago 39, Ill.—2
Whitley Electronics, Inc., 43 S. Main St., Andrews, Ind.—3

4—CONVERSION KITS & ADAPTERS

Stereo Phono Kit	1
Stereo Tape Recorder Kit	2
Multiplex Stereo Adapters	3

Admiral Corp., 3800 Cortland St., Chicago 47, Ill.—1
Affiliated Television Labs., Inc., 112-07 Francis Lewis Blvd., Queens Village 29, N. Y.—1
American Microphone Mfg. Co., 412 S. Wyman St., Rockford, Ill.—1
Ampex Audio, Inc., 1020 Kifer Rd., Sunnyvale, Calif.—2

Bard Record Co., 66 Mechanic St., New Rochelle, N. Y.—1
Bell Sound Div., 555 Marion Rd., Columbus 7, Ohio—2

Continental Mfg. Co., 1612 California St., Omaha 2, Nebr.—3

DeWald Radio, Div. United Scientific Labs., 35-15 37 Ave., Long Island City 1, N. Y.—3

Electronic Development Associates, 125 E. 46 St., New York 17, N. Y.—1

Fanon Electronic Industries Inc., 98 Berriman St., Brooklyn 8, N. Y.—1
Fisher Radio Corp., 21-21 44 Dr., Long Island City 1, N. Y.—3

Garrard Sales Corp., 80 Shore Rd., Port Washington, N. Y.—1

Harman-Kardon, Inc., 520 Main St., Westbury, L. I., N. Y.—3
Heath Co., Benton Harbor, Mich.—1-2-3

Karg Laboratories, Inc., 30 Meadow St., South Norwalk, Conn.—3

Lipps Engr., Co., Edwin A., 1511 Colorado Ave., Santa Monica, Calif.—2

North American Philips Co., 230 Duffy Ave., Hicksville, N. Y.—2
Nortronics Co., 1015 S. 6 St., Minneapolis 4, Minn.—2

Ortho-Sonic Instruments, Inc., 66 Mechanic St., New Rochelle, N. Y.—1

Revere Camera Co., 320 E. 21 St., Chicago 16, Ill.—2

Sargent-Rayment Co., 4926 E. 12 St., Oakland 1, Calif.—3
Sherwood Electronic Labs., Inc., 4300 N. California Ave., Chicago 18, Ill.—3
Smolin Labs., Woodbrook Drive, Springdale, Conn.—2
Stereo-Ette Co., 4908 N. Lincoln Ave., Chicago 25, Ill.—1

V-M Corp., 305 Territorial, Benton Harbor, Mich.—1-2

Webcor, Inc., 5610 Bloomingdale, Chicago 39, Ill.—1
Wells-Gardner & Co., 2701 N. Kildare Ave., Chicago 39, Ill.—1
Whitley Electronics, Inc., 43 S. Main St., Andrews, Ind.—1

5—MICROPHONES

Altec Lansing, 1515 S. Manchester St., Anaheim, Calif.
American Geloso Electronics, Inc., 251 Park Ave., South, New York 10, N. Y.
American Microphone Mfg. Co., 412 S. Wyman St., Rockford, Ill.
Ampex Audio, 1020 Kifer Rd., Sunnyvale, Calif.
Argonne Electronics Mfg. Corp., 165-11 South Rd., Jamaica 33, N. Y.
Astatic Corp., Conneaut, Ohio

Duotone Co., Locust St., Keyport, N. J.
Dynaco, Inc., 617 N. 41 St., Philadelphia 4, Pa.

Electronic Applications, Inc., 194 Richmond Hill Ave., Stamford, Conn.
Electro-Sonic Labs., Inc., 35-54 36 St., Long Island City 6, N. Y.
Electro-Voice, Inc., Cecil & Carroll Sts., Buchanan, Mich.
Ercona Corp., 16 W. 46 St., New York 36, N. Y.

Fen-Tone Corp., 106 5 Ave., New York 11, N. Y.

Lafayette Radio, 165-08 Liberty Ave., Jamaica 33, N. Y.

Permoflux Products Co., 4101 San Fernando Rd., Glendale 4, Calif.
Shure Bros., Inc., 222 Hartrey Ave., Evanston, Ill.
Sonotone Corp., Box 220, Elmsford, N. Y.
Superscope, Inc., 8520 Tujunga Ave., Sun Valley, Calif.

Tannoy (America) Ltd., P. O. Box 177, E. Norwich, N. Y.
Turner Microphone Co., 909 17 St., N. E., Cedar Rapids, Iowa

6—NEEDLES, STEREO

Astatic Corp., Harbor & Jackson Sts., Conneaut, Ohio
Berger Communications, 109-01 72 Rd., Forest Hills, N. Y.
Clevite-Walco, 60 Franklin St., E. Orange, N. J.
Duotone Co., Locust St., Keyport, N. J.
Fen-Tone Corp., 106 5 Ave., New York 11, N. Y.
Fidelitone Inc., 6415 Ravenswood Ave., Chicago 26, Ill.
General Electric Co., Audio Components Section, 1285 Boston Ave., Bridgeport 2, Conn.
Jensen Industries, 7333 W. Harrison St., Forest Park, Ill.
Miller Mfg. Co., M. A., 4 & Church St., Libertyville, Ill.
Pfanstiehl Chemical Corp., 104 Lake View Ave., Waukegan, Ill.
Pickering & Co., Sunnyside Blvd., Plainview, L. I., N. Y.
Recoton Corp., 62-35 Barnett Ave., Long Island City 4, N. Y.
Shure Bros., 222 Hartrey Ave., Evanston, Ill.
Televex Co., 111 Lake Ave., Tuckahoe, N. Y.
Webster Electric Co., 1900 Clark St., Racine, Wis.

7—SPEAKERS & CABINETS

Enclosures & Cabinets **1**
Speakers & Speaker Systems **2**

Acoustic Research, Inc., 24 Thorndike St., Cambridge 41, Mass.—2
Affiliated Television Labs., Inc., 112-07 Francis Lewis Blvd., Queens Village 29, N. Y.—1
Allied Radio Corp., 100 N. Western Ave., Chicago 80, Ill.—1-2
Altec Lansing, 1515 S. Manchester St., Anaheim, Calif.—1-2
Ampex Audio, Inc., 1020 Kifer Rd., Sunnyvale, Calif.—2
Argonne Electronics Mfg. Corp., 165-11 South Rd., Jamaica 33, N. Y.—2
Argos Products Co., Inc., 301 Main St., Genoa, Ill.—1
Arkay Electronics, Inc., 88-06 Van Wyck Expressway, Jamaica 18, N. Y.—1
Atlas Sound Corp., 1449 39 St., Brooklyn 18, N. Y.—2

Berger Communications, 109-01 72nd Rd., Forest Hills 75, N. Y.—1
Bozak Sales Co., R. T., P. O. Box 1166, Darien, Conn.—1-2

CBC Electronics Co., 2601 N. Howard St., Philadelphia 33, Pa.—1
Channel Master Corp., Ellenville, N. Y.—1-2
Cletron Inc., 1974 E. 61 St., Cleveland 3, Ohio—2

(Continued on page 134)

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☑ **13** years ago. Today, over...

☑ **65** different manufacturers have specified Sonotone for...

☑ **662** models of high-quality phonographs. Altogether over...

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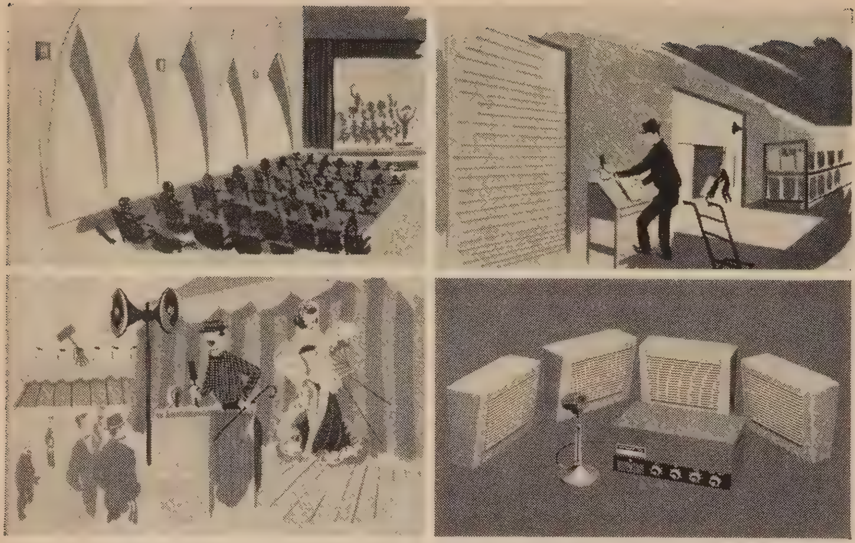

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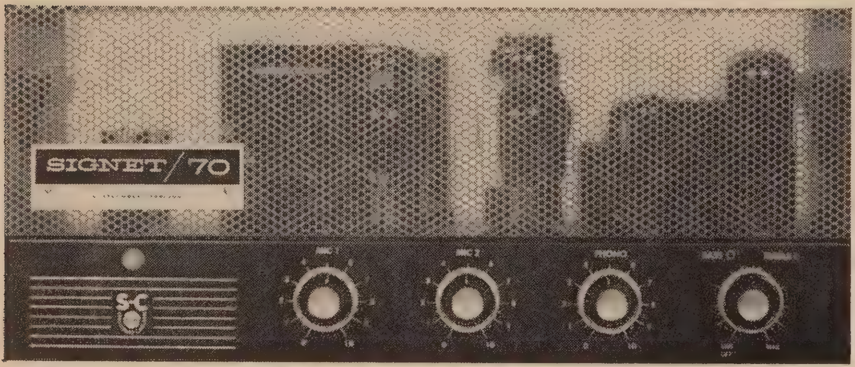

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Speakers & Cabinets

(Continued from page 133)

Duotone Co., Locust St., Keyport, N. J.—2
Dynamic Electronics-New York Inc., 87-46 123 St., Richmond Hill, N. Y.—1

Electron Enterprises Inc., 6917-21 Stanley Ave., Berwyn, Ill.—1
Electronic Instrument Co., (EICO) 33-00 Northern Blvd., Long Island City 1, N. Y.—2
Electro-Voice, Inc., Cecil & Carrol Sts., Buchanan, Mich.—1-2
Ercona Corp., 16 W. 46 St., New York 36, N. Y.—1-2

Fourjay Industries, 2360 W. Dorothy Lane, Dayton 39, Ohio—1

General Electric Co., Audio Components Section, 1285 Boston Ave., Bridgeport 2, Conn. —1-2

Hartley Products Co., 521 E. 162 St., New York 51, N. Y.—1-2
Heath Co., Benton Harbor, Mich.—1-2

Intelex Systems Inc., 22 Thames St., New York 6, N. Y.—2

Jensen Mfg. Co., 6601 S. Laramie Ave., Chicago 38, Ill.—2
JFD Electronics Corp., 6101 16 Ave., Brooklyn 4, N. Y.—2

Kingdom Products Ltd., 514 Broadway, New York 12, N. Y.—2
Klipsch & Associates, Inc., P. O. Box 96, Hope, Ark.—1-2

Lafayette Radio, 165-08 Liberty Ave., Jamaica 33, N. Y.—1-2
Lansing Sound, Inc., James B., 3249 Casitas Ave., Los Angeles 39, Calif.—2
L.E.E. Inc., 625 New York Ave., N. W., Washington 1, D. C.—1-2
Lowell Mfg. Co., 3030 Laclede Station Rd., St. Louis 17, Mo.—1

Markwell Assoc., Jeff, 764 6 Ave., New York 10, N. Y.—1
Middlesex Wood Products Corp., Littleton, Mass.—1
Moran Products Co., 2925 E. 55 St., Cleveland 27, Ohio—1
MP Eng'g. Co., Fairfield, Conn.—1

North American Philips Co., 230 Duffy Ave., Hicksville, N. Y.—1-2

Oxford Components, 556 W. Monroe St., Chicago 6, Ill.—1-2

Permoflux Products Co., 4101 San Fernando Rd., Glendale 4, Calif.—1-2

Quam-Nichols Co., Marquette & Prairie Sts., Chicago 16, Ill.—2

Recordio Corp., 603 W. Seminary, Charlotte, Mich.—2
RJ Audio Products Inc., 80 Shore Rd., Port Washington, N. Y.—1
Rockbar Corp., (Goodman) 650 Halstead Ave., Mamaroneck, N. Y.—2

Setchell-Carlson, Inc., New Brighton, St. Paul 12, Minn.—1-2
Sherwood Electronic Labs., Inc., 4300 N. California Ave., Chicago 18, Ill.—2
Smolin Labs., Woodbrook Drive, Springdale, Conn.—2
Sonic Industries, 19 Wilbur St., Lynbrook, N. Y. —1-2
Sonotone Corp., Box 200, Elmsford, N. Y.—1-2
Stephens Trusonic, 8538 Warner Dr., Culver City, Calif.—1-2
Sterling Hi-Fidelity Inc., 22-20 40 Ave., Long Island City 1, N. Y.—2
Stromberg-Carlson, 1400 N. Goodman, Rochester, N. Y.—1-2

Tannoy (America) Ltd., P. O. Box 177, E. Norwich, N. Y.—1-2

United Audio Products, Inc., 202 E. 19 St., New York 3, N. Y.—2
Universal Woodcrafters, Inc., 1302 State St., La Porte, Ind.—1-2
University Loudspeakers, Inc., 80 S. Kensico Ave., White Plains, N. Y.—1-2
Utah Radio & Electronic Corp., 1124 E. Franklin St., Huntington, Ind.—1-2

Waldom Electronics Inc., 4625 W. 53 St., Chicago 32, Ill.—2
Weathers Industries Div., Advance Industries Inc., 66 E. Gloucester Pike, Barrington, N. J.—2
Webcor, Inc., 5610 Bloomingdale, Chicago 39, Ill.—2
Wellcor Inc., 1214 N. Wells St., Chicago 10, Ill.—1
Wells-Gardner & Co., 2701 N. Kildare Ave., Chicago 39, Ill.—1
Wharfedale Div., British Industries Corp., 80 Shore Rd., Port Washington, N. Y.—1-2
Whitley Electronics, Inc., 43 S. Main St., Andrews, Ind.—1

8—TAPE

Blank	**1**
Prerecorded stereo	**2**

Artcorde Recorded Tapes, Box 561, Huntington, N. Y.—2
Audio Devices, Inc., 444 Madison Ave., New York 22, N. Y.—1
Concertapes Distributors, Inc., P. O. Box 88, Wilmette, Ill.—2
Duotone Co., Locust St., Keyport, N. J.—1
Ferrodynamics Corp., Gregg St. & Rte. 17, Lodi, N. J.—1
Fidelitone, Inc., 6415 Ravenswood Ave., Chicago 26, Ill.—1
Int'l. Pacific Recording Corp., 6906 Santa Monica Blvd., Hollywood 38, Calif.—2
Lafayette Radio, 165-08 Liberty Ave., Jamaica 33, N. Y.—1
Minn. Mining & Mfg. Co., 900 Bush Ave., Saint Paul 6, Minn.—1
ORR Industries, Shamrock Circle, Opelika, Ala.—1
Reeves Soundcraft Corp., Great Pasture Rd., Danbury, Conn.—1
Smolin Labs., Woodbrook Drive, Springdale, Conn.—2
Stereophony Inc., 8101 University Ave., Des Moines, Iowa—2

9—TAPE RECORDERS, PLAYBACKS, & ACCESSORIES

Accessories	**1**
Heads, stereo	**2**
Recorders & Playbacks, stereo	**3**

Alonge Products, Inc., 163 W. 23 St., New York 11, N. Y.—1
American-Concertone, Div. American Electronics, Inc., 9449 W. Jefferson Blvd., Culver City, Calif.—1-2-3
American Geloso Electronics, Inc., 251 Park Ave., South, New York 10, N. Y.—1-3
Ampex Audio, Inc., 1020 Kifer Rd., Sunnyvale, Calif.—1-3
Amplifier Corp. of America, 398 Broadway, New York 13, N. Y.—3
Audio Devices, Inc., 444 Madison Ave., New York 22, N. Y.—1
Audiotex Mfg. Co., Div. G-C Textron, Inc., 3225 Exposition Pl., Los Angeles 18, Calif.—1

Bell Sound Div., 555 Marion Rd., Columbus 7, Ohio—3
Berger Communications, 109-01 72nd Rd., Forest Hills, 75, N. Y.—2

Electronic Applications, Inc., 194 Richmond Hill Ave., Stamford, Conn.—1-2-3
Ercona Corp., 16 W. 46 St., New York 36, N. Y.—1-2-3

Fen-Tone Corp., 106 5 Ave., New York 11, N. Y.—1-2-3

General Kinetics Inc., 555 23 St., S. Arlington 2, Va.—1

Heath Co., Benton Harbor, Mich.—1-3

Int'l. Pacific Recording Corp., 6906 Santa Monica Blvd., Hollywood 38, Calif.—1

LaBelle Industries, 510 S. Worthington St., Oconomowoc, Wis.—1-3
Lafayette Radio, 165-08 Liberty Ave., Jamaica 33, N. Y.—1-3
L.E.E. Inc., 625 New York Ave., N. W., Washington 1, D. C.—2-3
Lipps, Engr. Co., Edwin A., 1511 Colorado Ave., Santa Monica, Calif.—2

Magnecessories, Box 6960, Washington 20, D. C.—1
Magnecord, Div. Midwestern Instruments Inc., 41 St. & Sheridan Rd., Tulsa 5, Okla.—1-2-3
Michigan Magnetics, Inc., 203 W. 3 St., Vermontville, Mich.—2
Microtran Co., 145 E. Mineola Ave., Valley Stream, N. Y.—1
Minn. Mining & Mfg. Co., 900 Bush Ave., St. Paul 6, Minn.—1

Newcomb Audio Products Co., 6824 Lexington Ave., Hollywood 38, Calif.—3
North American Philips Co., 230 Duffy Ave., Hicksville, L. I., N. Y.—3
Nortronics Co., 1015 S. 6 St., Minneapolis 4, Minn.—1-2

Pentron Corp., 777 S. Tripp Ave., Chicago 24, Ill.—1-3
Permoflux Products Co., 4101 San Fernando Rd., Glendale 4, Calif.—1
Pro-Tex Reel Band Co., 200 Film Bldg., Cleveland 14, Ohio—1

NEW HIGH FIDELITY DRIVERS
of great importance to technicians
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LINEAR-EFFICIENCY
PRECISION LOUDSPEAKERS

The new JBL Linear-Efficiency transducer, combining long linear excursion with relatively high efficiency, is engineered for sealed enclosure or infinite baffle installation. It is a development of great significance to the electronic technician because:
...it is an ideal replacement speaker;
...it can be readily mounted in a wall;
...it gives true precision reproduction in the small space frequently required in stereo installations;
...it does not require excessive power for full-range reproduction.

Sound from any existing system, except those employing the very best loudspeakers, can be greatly improved, easily, with the JBL Linear-Efficiency speaker because enclosure dimensions are not critical, and acoustical requirements can be readily met. The mounting flange is designed so that the speaker can be mounted **from the front**, or the rear, of the baffle—wall or enclosure. An enclosed volume of only two cubic feet, or more, is recommended.

The efficiency of the LE drivers is such that 20 watts is more than sufficient power for home use. However, the dynamic range of these long-throw speakers permits the use of much more powerful amplifiers.

Super 8" JBL MODEL LE8 (illustrated left) shows a flatness of response from 30 to 15,000 c.p.s. that is without precedent in a unit of this size. Impedance: 16 ohms. Flux: 223,500 Maxwells. Power capacity: 20 watts continuous program. Free air cone resonance: 37 c.p.s. Frame: rigid cast aluminum. Baffle hole diameter (front mounting): 7⅛". Shipping weight: 11 lbs.

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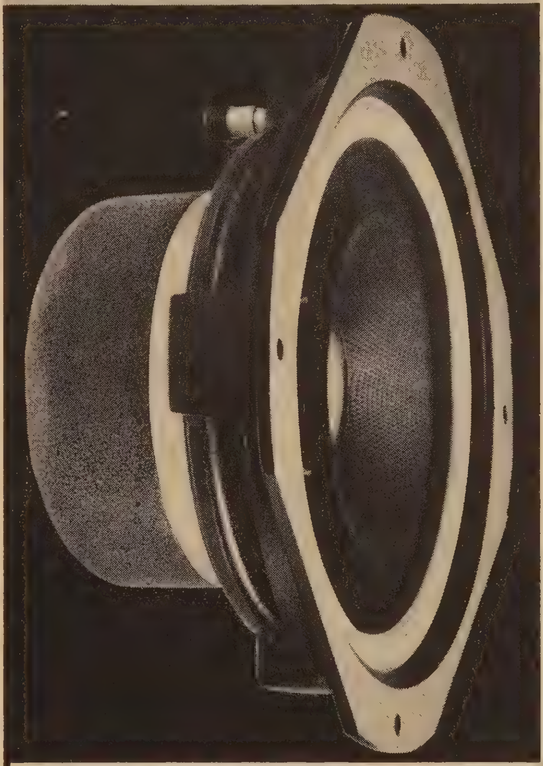

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JBL MODEL S5 includes a super 10" JBL MODEL LE10 Low Frequency Driver with free air cone resonance of 15 c.p.s; JBL MODEL LX3 Dividing Network for crossover at 1.000 c.p.s; JBL MODEL LE30 High Frequency Driver, a 5½ octave direct radiator. These three units form an integrated, perfectly matched, electro-acoustical system; they must be used with each other.

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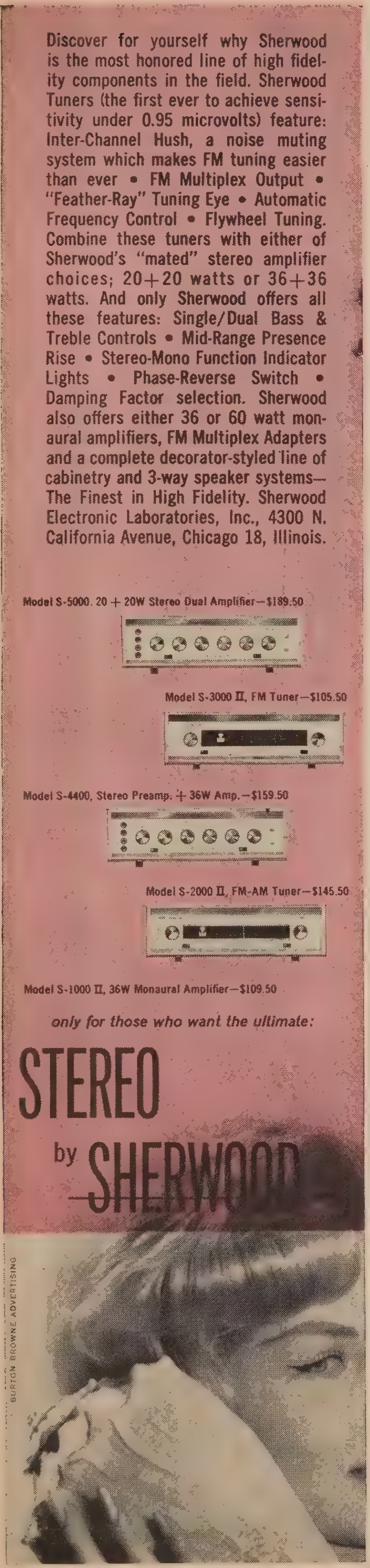

Discover for yourself why Sherwood is the most honored line of high fidelity components in the field. Sherwood Tuners (the first ever to achieve sensitivity under 0.95 microvolts) feature: Inter-Channel Hush, a noise muting system which makes FM tuning easier than ever • FM Multiplex Output • "Feather-Ray" Tuning Eye • Automatic Frequency Control • Flywheel Tuning. Combine these tuners with either of Sherwood's "mated" stereo amplifier choices; 20+20 watts or 36+36 watts. And only Sherwood offers all these features: Single/Dual Bass & Treble Controls • Mid-Range Presence Rise • Stereo-Mono Function Indicator Lights • Phase-Reverse Switch • Damping Factor selection. Sherwood also offers either 36 or 60 watt monaural amplifiers, FM Multiplex Adapters and a complete decorator-styled line of cabinetry and 3-way speaker systems—The Finest in High Fidelity. Sherwood Electronic Laboratories, Inc., 4300 N. California Avenue, Chicago 18, Illinois.

Model S-5000, 20 + 20W Stereo Dual Amplifier—$189.50

Model S-3000 II, FM Tuner—$105.50

Model S-4400, Stereo Preamp. + 36W Amp.—$159.50

Model S-2000 II, FM-AM Tuner—$145.50

Model S-1000 II, 36W Monaural Amplifier—$109.50

only for those who want the ultimate:

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TAPE Recorders

(Continued from page 135)

Recordio Corp., 603 S. Seminary, Charlotte, Mich.—1-2-3
Reiter Co., F., 3340 Bonnie Hill Dr., Hollywood 28, Calif.—1
Revere Camera Co., 320 E. 21 St., Chicago 16, Ill.—3
Robert Electronics Inc., 1045 N. Sycamore Ave., Hollywood 38, Calif.—1-3
Robins Industries Corp., 36-27 Prince St., Flushing 54, N. Y.—1-2

Shure Brothers, Inc., 222 Hartrey Ave., Evanston, Ill.—2
Smolin Labs., Woodbrook Drive, Springdale, Conn.—3
Superscope, Inc., 8520 Tujunga Ave., Sun Valley, Calif.—1-3

Telectrosonic Corp., 35-18 37 St., Long Island City 1, N. Y.—3

Universal Woodcrafters, Inc., 1302 State St., La Porte, Ind.—1

Viking of Minneapolis, Inc., 9600 Aldrich Ave., South, Minneapolis 20, Minn.—1-3
V-M Corp., 305 Territorial, Benton Harbor, Mich.—1-3

Webcor, Inc., 5610 Bloomingdale, Chicago 39, Ill.—1-3

10—TUNERS, AM &/OR FM

(includes receivers)

Allied Radio Corp., 100 N. Western Ave., Chicago 80, Ill.
Altec Lansing, 1515 S. Manchester St., Anaheim, Calif.
American Geloso Electronics, Inc., 251 Park Ave., South, New York 10, N. Y.
Ampex Audio, 1020 Kifer Rd., Sunnyvale, Calif.
Arkay Electronics, Inc., 88-06 Van Wyck Expressway, Jamaica 18, N. Y.

Bell Sound Div., 555 Marion Rd., Columbus 7, Ohio
Blonder-Tongue Laboratories, Inc., 9 Alling St., Newark 2, N. J.
Bogen-Presto Co., P. O. Box 500, Paramus, N. J.

Channel Master Corp., Ellenville, N. Y.
Continental Mfg., Inc., 1612 California St., Omaha 2, Nebr.

DeWald Radio, Div. United Scientific Labs., 35-15 37 Ave., Long Island City 1, N. Y.
Dynamic Electronics-New York Inc., 17-46 123 St., Richmond Hill, N. Y.

Electronic Applications, Inc., 194 Richmond Hill Ave., Stamford, Conn.
Electronic Development Associates, 125 E. 46 St., New York 17, N. Y.
Electronic Instrument Co. (EICO), 33-00 Northern Blvd., Long Island City 1, N. Y.
Ercona Corp., 16 W. 46 St., New York 36, N. Y.
Erie Resistor Corp., 644 W. 12 St., Erie 6, Pa.

Fisher Radio Corp., 2121 44 Dr., Long Island City 1, N. Y.

General Electric Co., Audio Components Section, 1285 Boston Ave., Bridgeport 2, Conn.
Gonset Div., Young Spring & Wire Corp., 801 S. Main St., Burbank, Calif.

Harman-Kardon, Inc., 520 Main St., Westbury, L. I., N. Y.
Heath Co., Benton Harbor, Mich.

Karg Laboratories, Inc., 30 Meadow St., South Norwalk, Conn.

Lafayette Radio, 165-08 Liberty Ave., Jamaica 33, N. Y.
Leak, Div. British Industries Corp., 80 Shore Rd., Port Washington, N. Y.

McIntosh Laboratory Inc., 2 Chambers St., Binghamton, N. Y.
Miller Co., J. W., 5917 S. Main St., Los Angeles 3, Calif.

Newcomb Audio Products Co., 6824 Lexington Ave., Hollywood 38, Calif.

Paco Electronics Co., 70-31 84 St., Glendale 27, L. I., N. Y.
Pilot Radio Corp., 37-06 36 St., Long Island City 1, N. Y.
Precision Electronics Inc., 9101 King St., Franklin Park, Ill.

Recordio Corp., 603 W. Seminary, Charlotte, Mich.

Sargent-Rayment Co., 4926 E. 12 St., Oakland 1, Calif.
Scott, Inc., H. H., 111 Powder Mill Rd., Maynard, Mass.
Setchell-Carlson, Inc., New Brighton, St. Paul 12, Minn.
Sherwood Electronic Labs., 4300 N. California Ave., Chicago 18, Ill.
Simpson Mfg. Co., Mark, 32-28 49 St., Long Island City 3, N. Y.
Sonic Laboratories, 19 Wilbur St., Lynbrook, N. Y.
Stromberg-Carlson, 1400 N. Goodman, Rochester, N. Y.
Symphonic Radio & Electronic Corp., 10 Columbus Circle, New York 19, N. Y.

Webcor, Inc., 5610 Bloomingdale, Chicago 39, Ill.
Wells-Gardner & Co., 2701 N. Kildare Ave., Chicago 39, Ill.

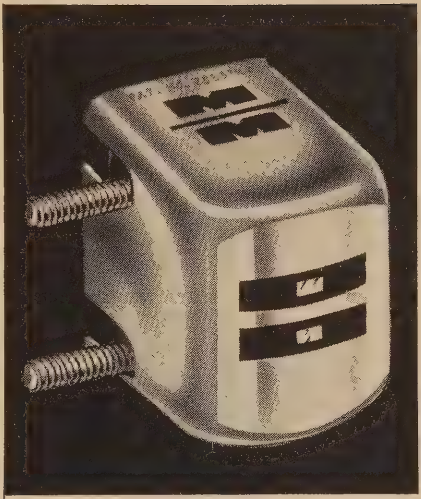
Alphabetical List of Manufacturers

(Numbers refer to sections in which products are listed.)

Acoustic Research, Inc., 24 Thorndike St., Cambridge 41, Mass.-7
Acro Products Co., 369 Shurs Lane, Philadelphia 28, Pa.-1
Admiral Corp., 3800 Cortland St., Chicago 47, Ill.-2-3-4
Affiliated Television Labs., Inc., 112-07 Francis Lewis Blvd., Queens Village 29, N. Y.-1-4-7
Allied Radio Corp., 100 N. Western Ave., Chicago 80, Ill.-1-2-7-10
Alonge Products, Inc., 163 W. 23 St., New York 11, N. Y.-9
Altec Lansing, 1515 S. Manchester St., Anaheim, Calif.-1-5-7-10
American-Concertone Div., American Electronics, Inc., 9449 W. Jefferson Blvd., Culver City, Calif.-9
American Geloso Electronics, Inc., 251 Park Ave., S., New York 10, N. Y.-5-9-10
American Microphone Mfg. Co., 412 S. Wyman St., Rockford, Ill.-2-4-5
Ampex Audio, Inc., 1020 Kifer Rd., Sunnyvale, Calif., 1-4-5-7-9-10
Amplifier Corp. of America, 398 Broadway, New York 13, N. Y.-9
Argonne Electronics Mfg. Corp., 165-11 South Rd., Jamaica 33, N. Y.-2-3-5-7
Argos Products Co., 301 Main St., Genoa, Ill.-7
Arkay Electronics, Inc., 88-06 Van Wyck Expressway, Jamaica 18, N. Y.-1-7-10
Artcorde Recorded Tapes, Box 561, Huntington, N. Y.-8
Astatic Corp., Conneaut, Ohio-2-3-5-6
Atlas Sound Corp., 1449 39 St., Brooklyn 18, N. Y.-7
Audio Devices, Inc., 444 Madison Ave., New York 22, N. Y.-8-9
Audio-Empire, Div., Dyna-Empire, Inc., 1075 Stewart Ave., Garden City, N. Y.-2-3
Audiogersh Corp., 514 Broadway, New York 12, N. Y.-2-3
Autocrat Electronics Co., 5024 Elm St., Skokie, Ill.-1
Audiotex Mfg. Co., Div. G-C Textron, Inc., 3225 Exposition Pl., Los Angeles 18, Calif.-9
Bard Record Co., 66 Mechanic St., New Rochelle, N. Y.-3-4
Bell Sound Div., 555 Marion Rd., Columbus 7, Ohio-1-4-9-10
Berger Communications, 109-01 72nd Rd., Forest Hills 75, N. Y.-2-6-7-9
Blonder-Tongue Laboratories, Inc., 9 Alling St., Newark 2, N. J.-1-10
Bogen-Presto Co., P. O. Box 500, Paramus, N. J.-1-3-10
Bozak Sales Co., R. T., P. O. Box 1166, Darien, Conn.-7
British Industries Corp., 80 Shore Rd., Port Washington. N. Y.-1-7-10
CBC Electronics Co., 2601 N. Howard St., Philadelphia 33, Pa.-7
CBS Electronics, Div. Columbia Broadcasting System, Inc., 100 Endicott St., Danvers, Mass.-2
Channel Master Corp., Ellenville, N. Y.-1-3-7-10
Cletron Inc., 1974 E. 61 St., Cleveland 3, Ohio-7
Clevite-Walco, 60 Franklin St., E. Orange, N. J.-6
Collaro-See Rockbar Corp.
Concertapes Distributors, Inc., P. O. Box 88, Wilmette, Ill.-8
Continental Mfg. Inc., 1612 California St., Omaha 2, Nebr.-1-4-10
DeRo Electronics, 10 Woods Ave., Roosevelt, L.I., N. Y.-1
DeWald Radio, Div. United Scientific Labs., 35-15 37 Ave., Long Island City 1, N. Y.-1-4-10
Duotone Co., Locust St., Keyport, N. J.-2-3-5-6-7-8
Dynaco Inc., 617 N. 41 St., Philadelphia 4, Pa.-1-2-3-5
Dynamic Electronics-New York Inc., 87-46 123 St., Richmond Hill, N. Y.-1-7-10
Electron Enterprises Inc., 6917-21 Stanley Ave., Berwyn, Ill.-1-7
Electronic Applications, Inc., 194 Richmond Hill Ave., Stamford, Conn.-1-2-3-5-9-10
Electronic Development Associates, 125 E. 46 St., New York 17, N. Y.-1-4-10
Electronic Instrument Co. (EICO), 33-00 Northern Blvd., Long Island City 1, N. Y.-1-7-10

Electro-Sonic Labs. Inc., 35-54 36 St., Long Island City 6, N. Y.-2-3-5
Electro-Voice, Inc., Buchanan, Mich.-2-5-7
Ercona Corp., 16 W. 46 St., New York 36, N. Y.-1-2-3-5-7-9-10
Erie Resistor Corp., 644 W. 12 St., Erie 6, Pa.-1-2-10
Fairchild Recording Equipment Corp., 10-40 45 Ave., Long Island City 1, N. Y.-1-2-3
Fanon Electronic Industries Inc., 98 Berriman St., Brooklyn 8, N. Y.-4
Fedtro Inc., Federal Electronics Sales Div., Federal Electronics Bldg., Rockville Centre, L. I., N. Y.-1-2-3
Fen-Tone Corp., 106 5 Ave., New York 11, N. Y.-2-3-5-6-9
Ferrodynamics Corp., Gregg St. & Rte. 17, Lodi, N. J.-8
Fidelitone, Inc., 6415 Ravenswood Ave., Chicago 26, Ill.-6-8
Fidelity Amplifier Co., 1633 N. Halsted St., Chicago 14, Ill.-1
Fisher Radio Corp., 2121 44 Dr., Long Island City 1, N. Y.-1-4-10
Fourjay Industries, 2360 W. Dorothy Lane, Dayton 39, Ohio-7
Garrard Sales Corp., 80 Shore Rd., Port Washington, N. Y.-3-4
General Electric Co.-Audio Components Section, 1285 Boston Ave., Bridgeport 2, Conn.-1-2-3-6-7-10
General Kinetics Inc., 555 23 St., S., Arlington 2, Va.-9
Glaser-Steers Corp., 155 Oraton St., Newark 5, N. J.-3
Gonset Div., Young Spring & Wire Corp., 801 S. Main St., Burbank, Calif.-10
Goodman-see Rockbar Corp.
Gray High Fidelity Div., 16 Arbor St., Hartford 1, Conn.-3
Greene Co., L. Charlton, 314 Washington St., Newton 58, Mass.-1
Grommes-see Precision Electronics Inc.
Gulton Industries, 212 Durham Ave., Metuchen, N. J.-2
Harman-Kardon, Inc., 520 Main St., Westbury, L. I., N. Y.-1-4-10
Hartley Products Co., 521 E. 162 St., New York 51, N. Y.-7
Heath Co., Benton Harbor, Mich.-1-2-3-4-7-9-10
Intelex Systems Inc., 22 Thames St., New York 6, N. Y.-1-7
Int'l Pacific Recording Corp., 6906 Santa Monica Blvd., Hollywood 38, Calif.-2-3-8-9
Jensen Industries, 7333 W. Harrison St., Forest Park, Ill.-6
Jensen Mfg. Co., 6601 S. Laramie Ave., Chicago 38, Ill.-7
JFD Electronics Corp., 6101 16 Ave., Brooklyn 4, N. Y.-7
Karg Laboratories, Inc., 30 Meadow St., S. Norwalk, Conn.-4-10
Kingdom Products Ltd., 514 Broadway, New York 12, N. Y.-7
Klipsch & Associates, Inc., P. O. Box 96, Hope, Ark.-7
LaBelle Industries, 510 S. Worthington St., Oconomowoc, Wis.-1-9
Lafayette Radio, 165-08 Liberty Ave., Jamaica 33, N. Y.-1-2-3-5-7-8-9-10
Lansing Sound, Inc., James B., 3249 Casitas Ave., Los Angeles 39, Calif.-7
Leak Div., British Industries Corp., 80 Shore Rd., Port Washington, N. Y.-1-10
L.E.E. Inc., 625 New York Ave., N. W., Washington 1, D. C.-7-9
Lesa of America, 11 W. 42 St., New York 36, N. Y.-1-2-3
Lipps Engr. Co., Edwin A., 1511 Colorado Ave., Santa Monica, Calif.-4-9
Lowell Mfg. Co., 3030 Laclede Station Rd., St. Louis 17, Mo.-7
McIntosh Laboratory Inc., 2 Chambers St., Binghamton, N. Y.-1-10
Magnecessories, Box 6960, Washington 20, D. C.-9
Magnecord Div., Midwestern Instruments Inc., 41 St. & Sheridan Rd., Tulsa 5, Okla.-1-9
Marantz Co., 25-14 Broadway, Long Island City 6, N. Y.-1
Markell Assoc., Jeff, 764 6 Ave., New York 10, N. Y.-7
Michigan Magnetics, Inc., 203 W. 3 St., Vermontville, Mich.-9
Microtran Co., 145 E. Mineola Ave., Valley Stream, N. Y.-9
Middlesex Wood Products Corp., Littleton, Mass.-7
Miller Co., J. W., 5917 S. Main St., Los Angeles 3, Calif.-10
Miller Mfg. Co., M. A., 4 & Church Sts., Libertyville, Ill.-6
Minnesota Mining & Mfg. Co., 900 Bush Ave., St. Paul 6, Minn.8-9
Moran Products Co., 2925 E. 55 St., Cleveland 27, Ohio-7
MP Eng'g Co., Fairfield 3, Conn.-1-7
Newcomb Audio Products Co., 6824 Lexington Ave., Hollywood 38, Calif.-1-9-10
North American Philips Co., 230 Duffy Ave., Hicksville, L. I., N. Y.-3-4-7-9
Nortronics Co., 1015 S. 6 St., Minneapolis 4, Minn.-1-4-9
ORR Industries, Shamrock Circle, Opelika, Ala.-8
Ortho-Sonic Instruments, Inc., 66 Mechanic St., New Rochelle, N. Y.-3-4
Oxford Components, 556 W. Monroe St., Chicago 6, Ill.-7
Paco Electronics Co., 70-31 84 St., Glendale 27, L. I., N. Y.-1-10
Pentron Corp., 777 S. Tripp Ave., Chicago 24, Ill.-9
Permoflux Products Co., 4101 San Fernando Rd., Glendale 4, Calif.-1-5-7-9
Pfanstiehl Chemical Corp., 104 Lake View Ave., Waukegan, Ill.-6
Pickering & Co., Sunnyside Blvd., Plainview, L. I., N. Y.-2-3-6
Pilot Radio Corp., 37-06 36 St., Long Island City 1, N. Y.-1-10
Precision Electronics Inc. (Grommes), 9101 King St., Franklin Park, Ill.-1-10
Pro-Tex Reel Band Co., 200 Film Bldg., Cleveland 14, Ohio-9
Quam-Nichols Co., Marquette & Prairie Sts., Chicago 16, Ill.-7
Radio Music Co., 84 S. Water St., Port Chester, N. Y.-2-3
Recordio Corp., 603 W. Seminary, Charlotte, Mich.-3-7-9-10
Recoton Corp., 62-35 Barnett Ave., Long Island City 4, N. Y.-6

STEREO
STEREO
1960



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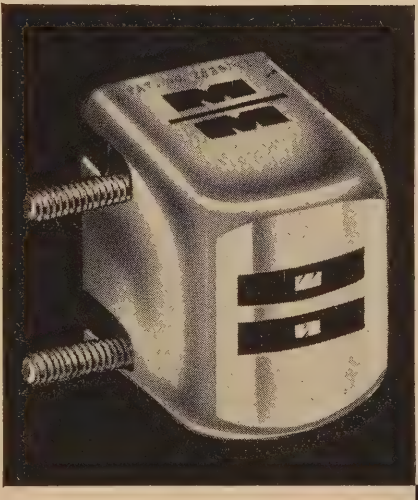
WITH M/M HEADS

STEREO
STEREO
1960



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(Continued from page 137)

Reeves Soundcraft Corp., Great Pasture Rd., Danbury, Conn.-8
Regency Div., IDEA, Inc., 7900 Pendleton Pike, Indianapolis 26, Ind -1
Reiter Co., F., 3340 Bonnie Hill Dr., Hollywood 28, Calif.-9
Rek-O-Kut Co., 38-19 108 St., Corona 68, N. Y.-3
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RJ Audio Products Inc., 80 Shore Rd., Port Washington, N. Y.-7
Roberts Electronics Inc., 1045 N. Sycamore Ave., Hollywood 38, Calif.-9
Robins Industries Corp., 36-27 Prince St., Flushing 54, N. Y.-9
Rockbar Corp., 650 Halstead Ave., Mamaroneck, N. Y.-2-3-7
Rye Sound Corp., (Headphones), 145 Elm St., Mamaroneck, N. Y.
Sargent-Rayment Co., 4926 E. 12 St., Oakland 1, Calif.-1-4-10
Scott, Inc., H. H., 111 Powder Mill Rd., Maynard, Mass.-1-2-3-10
Sechell-Carlson, Inc., New Brighton, St. Paul 12, Minn.-1-7-10
Shell Electronics Mfg. Corp., 112 State St., Westbury, N. Y.-1
Sherwood Electronic Labs. Inc., 4300 N. California Ave., Chicago 18, Ill.-1-4-7-10
Shure Brothers, Inc., 222 Hartrey Ave., Evanston, Ill.-2-3-5-6-9
Simpson Mfg. Co., Mark, 32-28 49 St., Long Island City 3, N. Y.-1-10
Smolin Labs., Woodbrook Drive, Springdale, Conn.-3-4-7-8-9
Sonic Industries, 19 Wilbur St., Lynbrook, N. Y -1-7-10
Sonotone Corp., Box 200, Elmsford, N. Y.-2-5-7
Stephens Trusonic, 8538 Warner Dr., Culver City, Calif.-7
Stereo-Ette Co., 4908 N. Lincoln Ave., Chicago 25, Ill.-4
Stereophony Inc., 8101 University Ave., Des Moines, Iowa-8
Sterling Hi-Fidelity Inc., 22-20 40 Ave., Long Island City 1, N. Y.-7
Stromberg-Carlson, 1400 N. Goodman, Rochester, N. Y.-1-3-7-10
Superscope, Inc., 8520 Tujunga Ave., Sun Valley, Calif.-5-9
Switchcraft, Inc., 5555 N. Elston Ave., Chicago 30, Ill.-1
Symphonic Radio & Electronic Corp., 10 Columbus Circle, New York 19, N. Y.-10
Tannoy (America) Ltd., P. O. Box 177, E. Norwich, N. Y.-2-5-7
Telectrosonic Corp., 35-18 37 St., Long Island City 1, N. Y.-9
Televex Co., 111 Lake Ave., Tuckahoe, N. Y.-6
Thorens Co., Thorens Ave., New Hyde Park, N. Y.-3
Turner Microphone Co., 909 17 St., N. E., Cedar Rapids, Iowa-5
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Universal Woodcrafters, Inc., 1302 State St., La Porte, Ind.-7-9
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V-M Corp., 305 Territorial, Benton Harbor, Mich.-3-4-9
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Waldom Electronics Inc., 4625 W. 53 St., Chicago 32, Ill.-7
Weathers Industries Div., Advance Industries, Inc., 66 E. Gloucester Pike, Barrington, N. J.-1-2-3-7
Webcor Inc., 5610 Bloomingdale, Chicago 39, Ill.-1-3-4-7-9-10
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Wellcor Inc., 1214 N. Wells St., Chicago 10, Ill.-7
Wells-Gardner & Co., 2701 N. Kildare Ave., Chicago 39, Ill.-1-4-7-10
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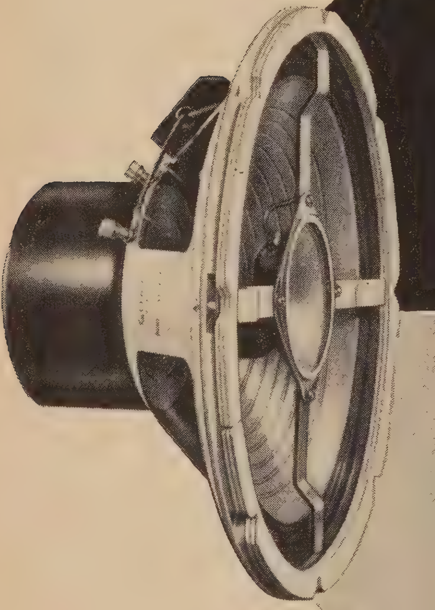

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with name of secretary unless otherwise noted

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American Institute of Electrical Engineers 33 W 39 St New York 18 N. Y.—N S Hibshman
American Institute of Physics 335 E 45 St New York 17 N Y—Wallace Waterfall
American Physical Society Pupin Physics Labs Columbia University New York 27 N Y—Dr Karl K Darrow
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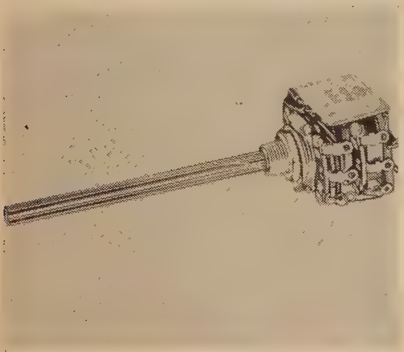
The stereo compentrol is designed to boost the bass and treble response, at various loudness levels, by automatically compensating for the Fletcher-Munson effect. Ideal for improving the sound of low cost stereo phonos and other hi-fi equipment that do not have compensated volume controls. The unit consists of two matched volume controls each with its own PEC packaged tone compensating circuit. Both controls are operated from the same shaft to assure equal compensation of both stereo circuits. Two types are available for the replacement of 500K ohm and 1 megohm volume controls. Centralab, 900 E. Keefe Ave., Milwaukee 1, Wisc. (ELECTRONIC TECHNICIAN 9-32)



For more information, write in ELECTRONIC TECHNICIAN's code number at end of item on inquiry card, page 83.

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Analyzing Stereo Cartridge

(Continued from page 100)

deriving an in-phase signal from a horizontal motion. Because low frequencies (long wavelengths) are essentially in-phase signals (due to relative shortwave time between mikes) this eliminates some problems associated with vertical modulation of the groove.

Connecting both cartridge elements in parallel will enable the cartridge to combine lateral information and be insensitive to vertical motion. (Equal and opposite voltages cancel each other.) Therefore, the stereo cartridge may reproduce the lateral modulation of monophonic discs.

3-Pin Or 4-Pin

Some questions may be advanced concerning the use of 3 or 4 terminal cartridges. For most applications, both can be satisfactory. The 4 terminal cartridge offers the availability of separate ground connections. This feature may be beneficial if a ground loop problem is encountered or some other unstable situation due to a common ground connection.

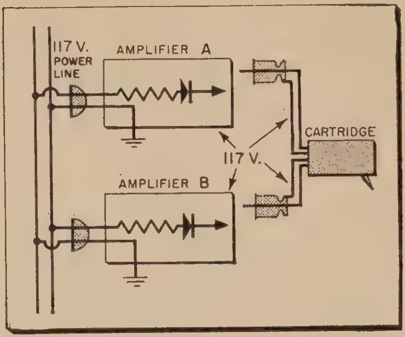


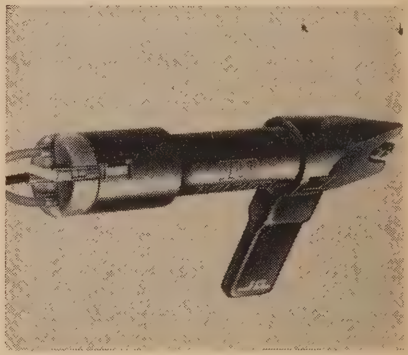
Fig. 3—Some a-c/d-c equipment and cartridges may present a possible shock hazard.

A degree of precaution should be exercised if interconnecting separate ac-dc amplifiers are to one side of the power line. If the low side of the plugs or jacks are connected to the chassis, there is a danger of placing the full line voltage across a 4 terminal cartridge's two ground terminals, which may be spaced less than 1/16" apart. See Fig. 3. Normally these jacks are not at chassis ground and most hi-fi equipment is transformer powered with line voltage leakage to ground at safe limits.

Channel separation is a necessary design consideration for stereo cartridges. The degree of crosstalk, the audio of one channel appearing in the second channel, or vice-versa, varies with each manufacturer's cartridge. A channel separation of 20 db or more in the audio range giving the stereo effect is considered adequate to minimize crosstalk. Unfortunately, most manufacturers do not indicate the audio range where the channel separation specification is applicable. •

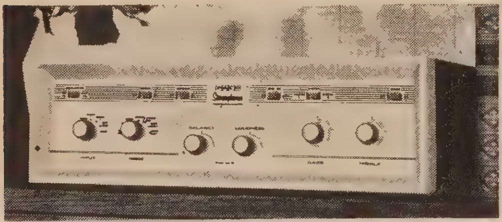
Sonotone STEREO CARTRIDGE

Model 10T unitized ceramic stereo cartridge provides two thoroughly isolated channels of hi fidelity reproduction. The range is from 20 to 15,000 cycle flat RIAA. The high output of half a volt eliminates the need for preamplifiers. The output is naturally flat to RIAA characteristics and requires no equalizers. Available in four style combinations. $6.45 including mounting bracket with 0.7 mil, 3-mil turnover sapphire jewel tips. For more stereo plays, it is also available with dual 0.7-mil sapphire jewel tips at the same price or with a sapphire-diamond combination at $16.50. Fuse clip type cartridge alone is $5.95 and $16.00. Sonotone Corp., Elmsford, N. Y. (ELECTRONIC TECHNICIAN 9-36)



Clarostat RESISTOR

An exact replacement for voltage-dropping in the filament of some TV sets, particularly portables, is made available as the firm's model P25K-41 ohm fixed resistor. It is an exact duplicate for GE Part RRW-148. Available from electronic parts distributors. Clarostat Mfg. Co., Dover, N. H. (ELECTRONIC TECHNICIAN 9-13)



PACO is the kit division of *PRECISION* Apparatus Co., Inc., world famous manufacturers of laboratory electronic instruments for over a quarter century.

The new PACO Model SA-40 offers you greater reserve power capacity than any other preamp-amplifier in its category. Its exceptional circuit design assures highly stable performance with extremely low distortion. And...the SA-40 provides maximum flexibility in *any* stereophonic high fidelity system present or contemplated.

outstanding specifications:
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Export: Morhan Exporting Corp., 458 B'way, N. Y. 13
Can.: Atlas Radio Corp., Ltd., 50 Wingold Ave., Toronto 19

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also available factory wired (SA-40W)... $129.95

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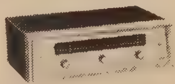


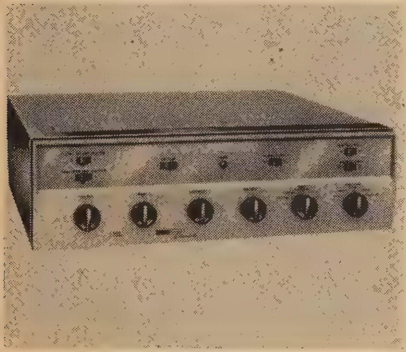
*Model ST-45
AM/FM Stereo Tuner Kit
matching companion
for the SA-40*

Continental STEREO AMPLIFIER

Model SA-30 stereo amplifier, 15 watts/channel, has 16 to 30,000 cps response ± 1.1 db. Harmonic distortion is less than 0.2%. Hum and noise level: 90 db below full output. Impedance 8 and 16 ohms per channel, 4 and 8 ohms when strapped. Inputs: 4 pairs for each channel, magnetic phono, crystal or ceramic phono, and tape. Has 6 position selector switch and 10 db inverse feedback from secondary of output transformer to driver stage. Continental Mfg. Co., 1612 California St., Omaha, Neb. $99.95. (ELECTRONIC TECHNICIAN 9-37)

Harman-Kardon STEREO AMPLIFIER

The Chorale, model 260 dual amplifier, 30/watts channel, features: third channel speaker selector, friction-clutch tone controls, tone control defeat switch, silicon diode power supply, illuminated push-button on/off switch, subsonic filter, speaker phasing switch and impedance selector switches. $199.95. Optional enclosure $12.95. Harman-Kardon, 520 Main St., Westbury, L. I. N. Y. (ELECTRONIC TECHNICIAN 9-34)



DON'T MISS

STEREO CATALOG, PAGE 115

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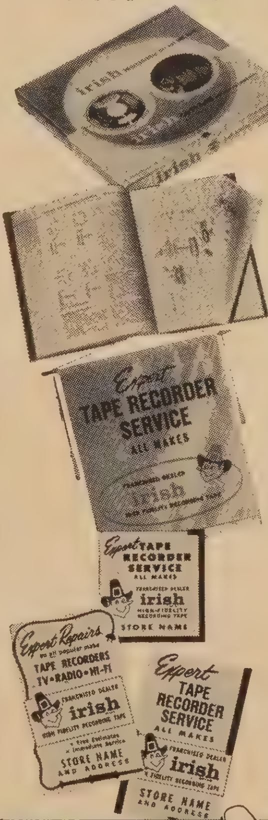
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Styli

(*Continued from page 102*)

service from it. Fig. 2 illustrates how a stylus that is too large, with normal tracking pressure, rides high in the groove. Distortion due to a tendency to bounce in the groove is introduced. Also introduced are some serious tracking problems such as groove skipping and, with some changers, failure to trip the cycling mechanism. Excessive wear and further distortion may be expected if the stylus pressure is increased.

The opposite abnormality, using too small a stylus, shown in Fig. 3, will result in contact at the bottom of the groove, Consequently, the stylus will move about without properly contacting the groove sidewalls and cause distortion and excessive wear. Raising the tracking pressure would only intensify both record and stylus wear.

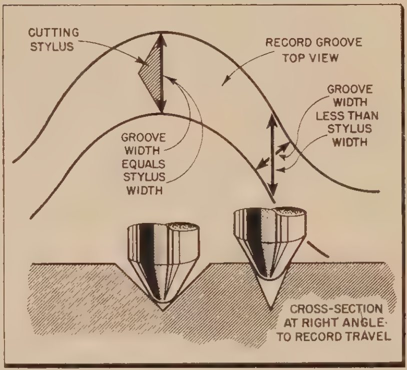
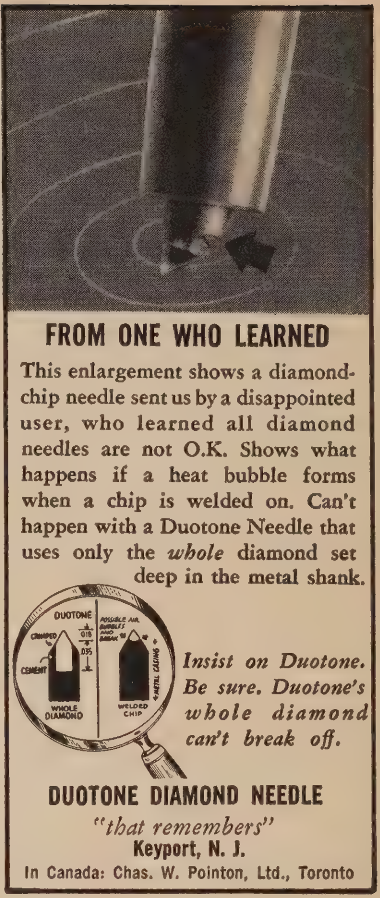

CUTTING STYLUS
RECORD GROOVE TOP VIEW
GROOVE WIDTH LESS THAN STYLUS WIDTH
GROOVE WIDTH EQUALS STYLUS WIDTH
CROSS-SECTION AT RIGHT ANGLE TO RECORD TRAVEL

Fig. 4—The sidewise motion of the cutter results in a narrower groove with respect to the playback stylus whenever the groove is laterally modulated. The narrower groove pinches the stylus, causing it to rise and fall. Since stereo cartridges reproduce the vertical component as well as the horizontal one, lateral modulation increases distortion in the vertical component.

Pinch Effect

Pinch in a monophonic record is actually a narrowing of the groove width, caused by sidewise movements of the cutting stylus. When the relative motion between the disc and cutter is straight ahead, the groove width is maximum. Thus, when recording a sinusoidal signal, the groove width is maximum at the peaks and when there is no modulation, as illustrated in Fig. 4. Since the playback stylus is round, it is pinched upward twice for each sine


FROM ONE WHO LEARNED

This enlargement shows a diamond-chip needle sent us by a disappointed user, who learned all diamond needles are not O.K. Shows what happens if a heat bubble forms when a chip is welded on. Can't happen with a Duotone Needle that uses only the *whole* diamond set deep in the metal shank.

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CEMENT
WHOLE DIAMOND
WELDED CHIP

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West Coast Warehouse:
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wave. Therefore, it will be forced up and down 2,000 times for a 1,000 cps signal.

If vertical motion did not produce an output from the cartridge, the result of pinch effect would be negligible. Stereo records, unlike monophonic records, produce an output when vertically modulated. Accordingly, this detrimental effect cannot be disregarded. It produces 2nd harmonic distortion and disturbing IM distortion in the vertical direction. This impairs the quality of the high frequency response.

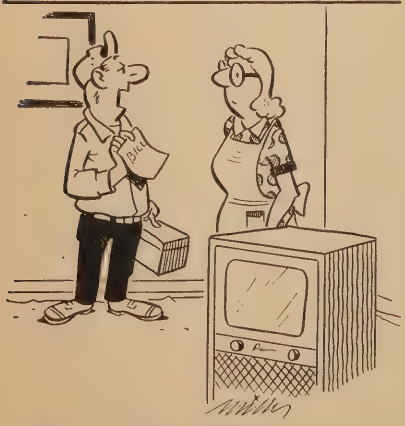
Alignment

The stylus should be aligned at a 90° angle to the record surface. If improperly aligned, additional pressure will be applied to one of the groove walls, with possible damage to it. In addition, less than optimum reproduction will be achieved, due to distortion and a factor unkown to monophonic cartridges, crosstalk.

Stylus Material

Since the advent of LP's, the diamond stylus has gained considerable acceptance. It is now widely recognized that diamonds are the most inexpensive tip substance over a projected period of time.

Although way up on the hardness scale, diamond styli are not "lifetime needles." While it is true that quality diamond styli have a life many times that of sapphires, they should be periodically inspected for wear. Furthermore, keeping records free of dust and other abrasive materials accumulating in grooves will result in less wear, and therefore less expense, for both styli and records. •



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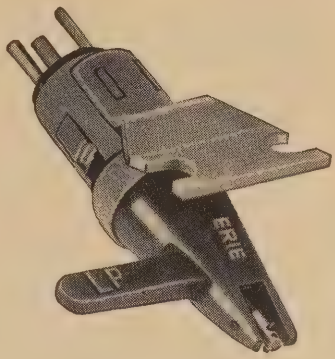
More PROFITS from stereo conversions with ERIE...

NEW STERIEO CERAMIC CARTRIDGE



This high quality single-element stereophonic cartridge is ideal for converting monaural record players to stereo. Dual stylus—sapphire-sapphire. Frequency response: 20 to 16,000 cps. Tracking force: 5 grams. Output: 0.5V, each channel. Channel separation: 20 DB. *Regular list price . . .* $8.95

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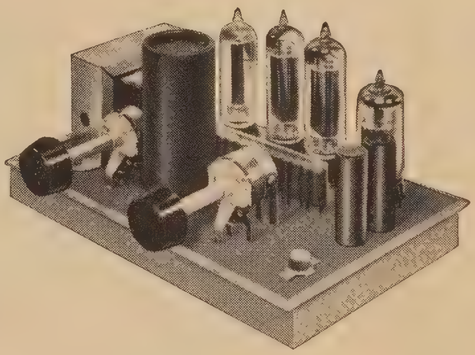

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NOTE THESE OUTSTANDING SPECIFICATIONS: HARMONIC DISTORTION, less than 2% (20 cps-20 kc) at 14 watts. I.M. DISTORTION, less than 1% (60 and 6,000 cps, 4:1) at 14 watts. FREQUENCY RESPONSE, 20 cps-20 kc, ±1 db at 14 watts. HUM & NOISE, mag. phono input, 47 db below 14 watts, tuner and xtal phono input, 63 db below 14 watts. A truly remarkable buy for the beginning or advanced audiophile.

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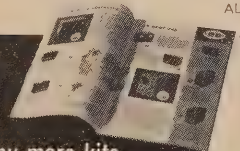

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Stereo Cartridges — 1 Yr. Later

(Continued from page 98)

is not to say that the cartridges were inadequate; rather, they were good performers. However, the many years of design improvements for monophonic cartridges could not be accomplished in the short period of time available for the crash program introduction of stereo.

It was therefore not surprising that most of the early stereo pickups reaching the market were adaptations of the same company's monophonic line. In view of the different motion taken by the stylus, this did not lead to the optimum cartridge design for stereo. Now that the "second round" is here, recent designs are definitely improved.

One of the major problems faced by cartridge manufacturers include equal output of both elements. Substantially dissimilar outputs are apparent and disturbing. Some cartridges operated very well, while others of the same brand were critical and did not perform as well. The chances of getting a "lemon" were higher with stereo cartridges than with monophonic cartridges.

New Designs

Some of the newer magnetic designs employ cantilever principles to achieve push-pull operation in both channels, resulting in better quality. The moving magnet designs seem to adapt themselves to stereo operation successfully, and several such new designs have been introduced. Ceramic designs include the use of compliance coupling, and frequently offer very good performance.

Stereo cartridges now have three or four pin connections—even five—instead of only two. These are by no means standardized. Almost every cartridge has a different pin connection, not only for the channel element, but also the actual physical positioning. This results in a stronger trend towards integrated cartridges and arms since different socket connections are an inconvenience.

The impact of stereo has already made substantial inroads on cartridge design. Design patterns are fairly well established. More refinements may be anticipated, all geared toward obtaining better stereo. •

Stereo Discs—Technical

(Continued from page 93)

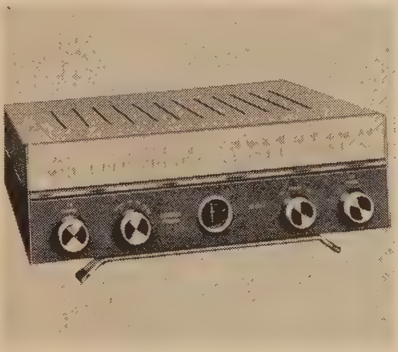
impression caused by visualizing a two-dimensional drawing of a stereo disc. The weaving back and forth of the groove's sidewalls indicates *vertical* motion of the stylus rather than the usual misconception of horizontal or lateral motion. The upper grooves in Fig. 4 have sidewalls going back and forth, yet there is no stylus lateral motion. Rather, the narrowing and widening grooves result in a rising and falling stylus. It is the *center* of the groove that describes lateral motion.

Since the stylus can assume a position that is displaced both horizontally and vertically from a given reference point, it is possible for the groove to have different widths and different lateral displacements from one instant to the next. Therefore, the groove walls do not appear to be symmetrical. The groove center line in the first figure of Fig. 5 shows lateral movement to the left, while the wider distance between the walls show vertical modulation in a downward direction. In the second figure the stylus is riding high due to the narrow walls pinching the stylus in an upward direction. The center line indicates no lateral movement. Again there is no lateral movement in the third figure as indicated by the center line. In the fourth figure, the stylus has been displaced to the right, but riding at reference height.

Since the stylus contacts both sidewalls at any given instant and its relative width and lateral displacement transmits the intelligence to both cartridge elements at the same time, is it correct to say one wall contains the intelligence of one channel? Where would the stylus be if one wall were left out? Obviously, distinctly separate channel groove information is an oversimplified statement that tends to confuse rather than illuminate the actual operation of stereo discs. The stylus moves due to the *combination* of two signals that combine to form the shape and relative position of both sidewalls. Thus, the walls are formed by the resultant of two forces, rather than two independent individual forces. •

Bogen FM/AM TUNER

Model ST442 has 9 tubes and 3 diodes and will receive simulcast stereo FM/AM programs, FM and AM. With the addition of a special adapter, it will also receive multiplex stereo (FM/FM). Features include: built-in FM antenna; built-in ferrite loopstick; provision for external antennas; individual tuning meters for FM and AM; automatic volume control and frequency control on each channel and a cathode follower output. FM response is 20 to 18,000 cps ± 0.5 db. AM response is 20 to 4,500 cps ± 1.5 db. FM sensitivity is 1.5μ v —30 db quieting at 75 ohm input. AM loop sensitivity is 100 μv per meter, 20 db signal-to-noise. $149.50 Bogen-Presto Co., Box 500, Paramus, N. J. (ELECTRONIC TECHNICIAN 9-33)



New

PROFESSIONAL 55

the Ultimate
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COLUMBIA CD
PROFESSIONAL 55
The Ultimate Stereo Cartridge

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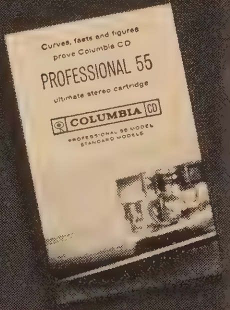
Curves, facts and figures prove Columbia CD
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ultimate stereo cartridge
COLUMBIA CD

Ask for Bulletin E-331. Check the Professional 55's superiority in: linearity . . . separation . . . needle point impedance . . . low mass . . . freedom from hum and distortion . . . output level. . .and ruggedness.

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Stereo Disc Appraisal

(Continued from page 91)

sion. Surely, early LP's were not equal to the best 78's of that period, and many persons predicted that people who value quality would continue to build their 78 collection.

In retrospect, this sounds ludicrous, since LP's today are generally superior to the 78's. The advent of LP's required the development of new record making techniques and the design of improved microgroove pickups. The introduction of stereo records involves no less a transition. Record cutting equipment and pickups capable of transcribing the more complicated record grooves still need to be evolved.

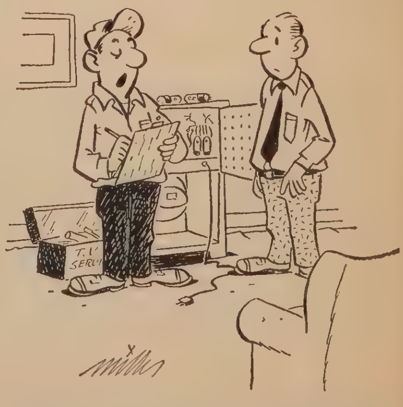
Unproved Products

Another source of irritation to many consumers is the feeling that a product should be fully perfected before placing it on the market. This idealistic viewpoint is commendable, but unfortunately the slight inadequacies of a product are not always readily discernible until the product is sold to a large number of people and used over a reasonable period of time. Only actual production can identify what really constitutes a practical working standard. Improvements and refinements based on this working standard can then be reliably obtained. The economic costs of continual low production runs to be issued as free samples until so-called "perfection" is achieved would be prohibitive.

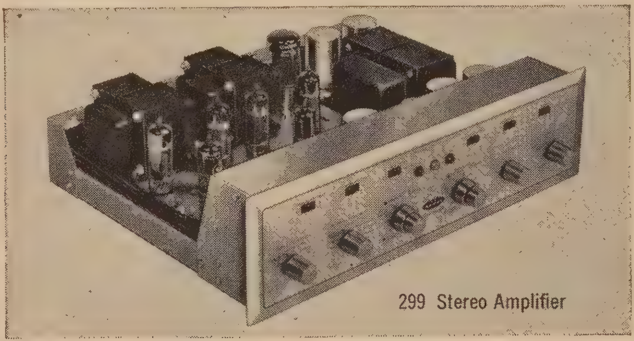
In order to perfect records, a pickup that is good enough to show an improvement is needed. Similarly, it is difficult to know when a pickup is better unless the record is good enough to indicate an improvement. With these two dependent products it is inevitable that improvement is like a game of tennis, sending the ball from one to the other. At one moment records will be as good as any pickup available to play them. Then an improved pickup will be designed that will ferret out defects in records; it's now the record's turn to improve.

Early stereo discs suffered from inadequate knowledge of effective microphone placement. Also, newly developed 45/45 cutters were unable to match the quality of the monophonic cutters. As an example, the treble response of the early stereo discs was entirely inadequate. Both these situations have improved and no doubt will continue to do so.

The arrival of better stereo discs will upgrade, rather than out-date, present stereo equipment. Record manufacturers are constantly experimenting with different techniques and are confident that the persons who predict a mass return to monophonic after a brief "craze" will find themselves in the same boat as those, who a decade earlier, predicted a full scale return to 78's. •



"We'll give you the best possible trade-in on your old set. Let's see, now—used tuning knobs are worth about nine cents."



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THE BALLAD, Model A230: Dual 15 watt amplifiers and dual preamplifiers in a magnificently styled instrument. *Friction-Clutch Tone Controls:* Bass and treble controls adjust separately for each channel. Once adjusted, the controls lock automatically to provide convenience of ganged operation. *Exclusive Third Channel Speaker Selector:* Remarkable new development permits addition and operation of a third channel speaker in local or remote stereo systems. Also permits simultaneous operation of virtually *any* combination of speakers – stereo and monaural – in local and remote installations. *Illuminated Push-Button On/Off Switch:* Wonderfully convenient device permits amplifier to be turned on and off without upsetting careful setting of controls. *Speaker Phasing Switch:* Corrects for improperly recorded program material. *Subsonic Filter:* Eliminates phonograph rumble.

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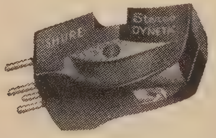

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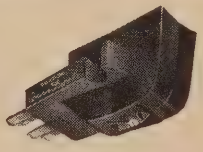

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PHILCO
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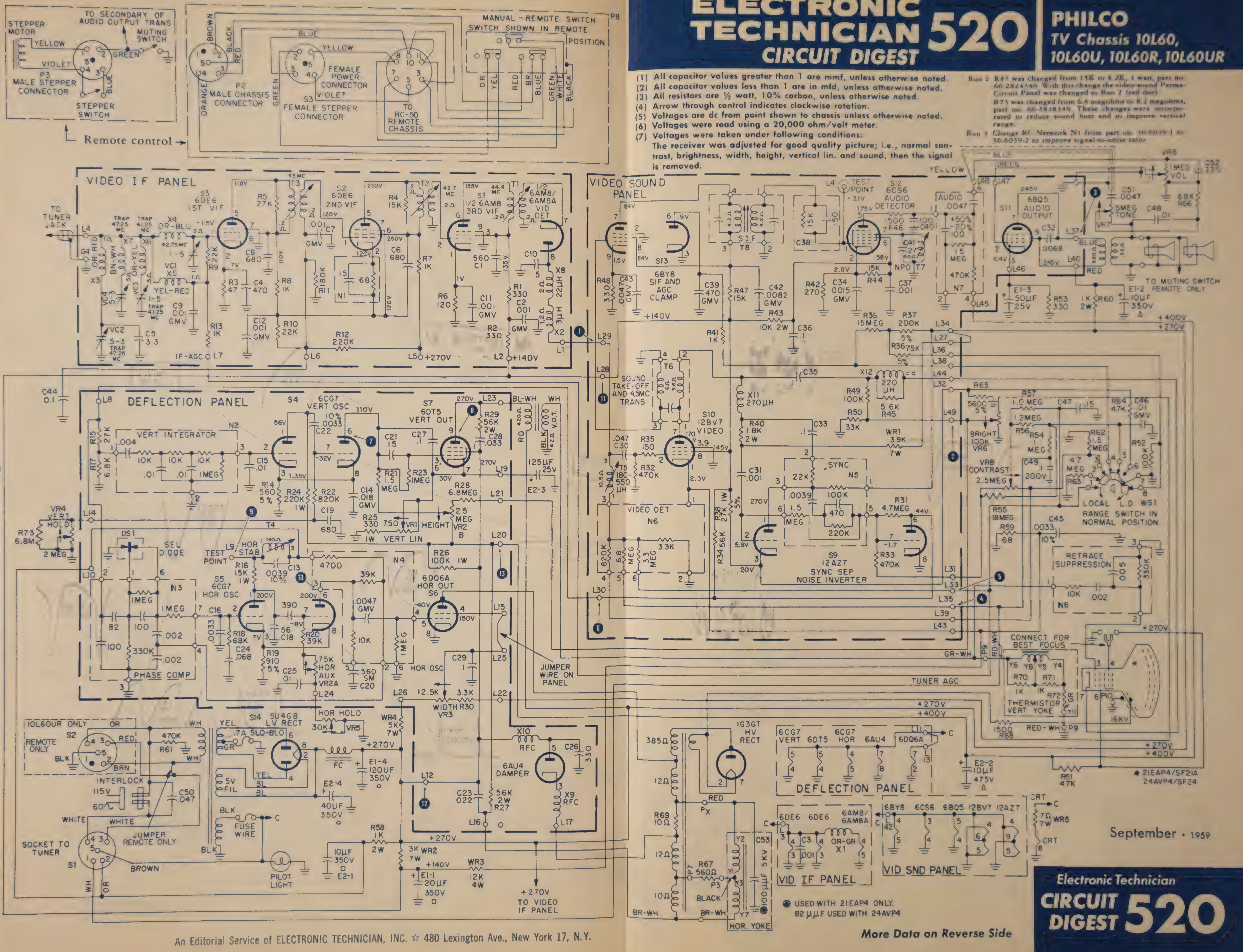
(1) All capacitor values greater than 1 are mmf, unless otherwise noted.
(2) All capacitor values less than 1 are in mfd, unless otherwise noted.
(3) All resistors are ½ watt, 10% carbon, unless otherwise noted.
(4) Arrow through control indicates clockwise rotation.
(5) Voltages are dc from point shown to chassis unless otherwise noted.
(6) Voltages were read using a 20,000 ohm/volt meter.
(7) Voltages were taken under following conditions:
The receiver was adjusted for good quality picture; i.e., normal contrast, brightness, width, height, vertical lin. and sound, then the signal is removed.

Run 2 R47 was changed from 15K to 8.2K, 1 watt, part no 66-2824340. With this change the video sound Perma-Circuit Panel was changed to Run 2 (red dot).
R73 was changed from 6.8 megohms to 8.2 megohms, part no. 66-5828340. These changes were incorporated to reduce sound buzz and to improve vertical range.

Run 3 Change RC Network N1 from part no. 30-6039-1 to 30-6039-2 to improve signal-to-noise ratio.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MANUAL - REMOTE SWITCH
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P8
VIDEO I F PANEL
TO TUNER JACK
S3 6DE6 1ST VIF
S2 6DE6 2ND VIF
S1 1/2 6AM8 3RD VIF
T1 1/2 6AM8/6AM8A VID DET
IF-AGC
DEFLECTION PANEL
VERT INTEGRATOR
S4 6CG7 VERT OSC
S7 6DT5 VERT OUT
V.O.T.
VR4 VERT HOLD
SEL DIODE
S5 6CG7 HOR OSC
HOR STAB
TEST POINT
S6 6DQ6A HOR OUT
PHASE COMP
HOR OSC
JUMPER WIRE ON PANEL
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S13 6BY8 SIF AND AGC CLAMP
SIF T8
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BRIGHT 100K VR6
VR8 CONTRAST 2.5MEG
LOCAL L.D. WS1 RANGE SWITCH IN NORMAL POSITION
RETRACE SUPPRESSION
CONNECT FOR BEST FOCUS
THERMISTOR VERT YOKE
TUNER AGC
1G3GT HV RECT
HOR. YOKE
16KV
* 21EAP4/SF21A 24AVP4/SF24
DEFLECTION PANEL
VID IF PANEL
VID SND PANEL
USED WITH 21EAP4 ONLY. 82 μμF USED WITH 24AVP4

September • 1959

More Data on Reverse Side

Special Full-Width SPRING BINDER Holds 24 Groups of ELECTRONIC TECHNICIAN'S CIRCUIT DIGESTS Available @ $2.95

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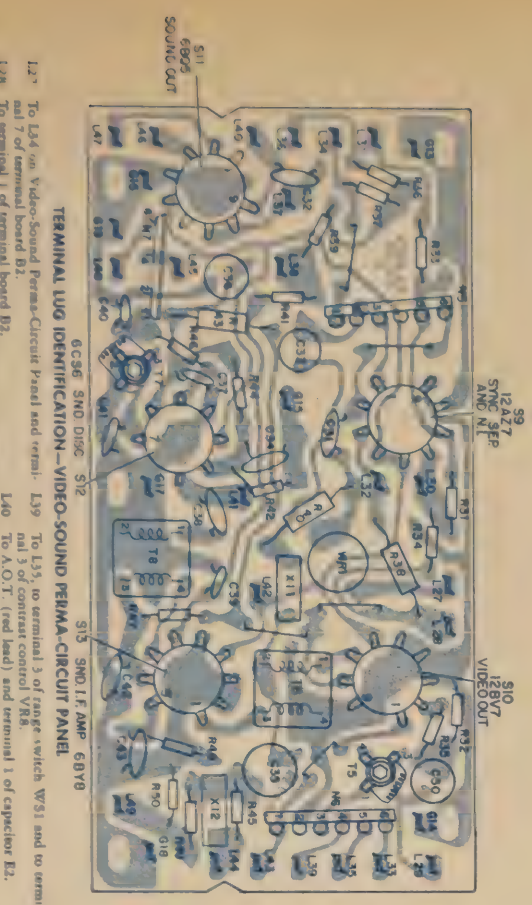
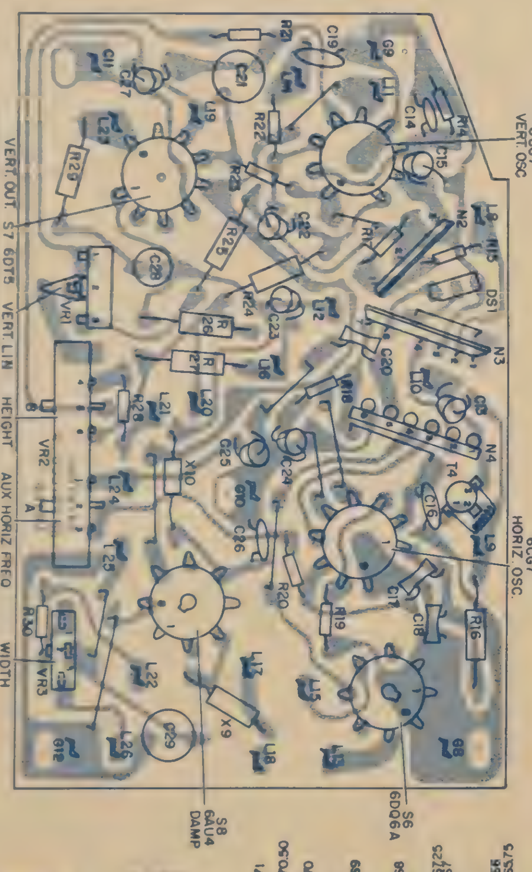
TERMINAL LUG IDENTIFICATION—VIDEO-SOUND PERMA-CIRCUIT PANEL

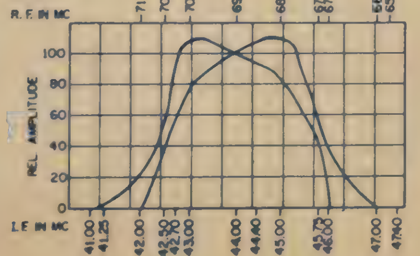
L27 To L34 on Video-Sound Perma-Circuit Panel and terminal 7 of terminal board B2.
L28 To terminal 1 of terminal board B2.
L29 To L1 on Video I-F Perma-Circuit Panel (2nd detector test point.)
L30 To L8 on Deflection Perma-Circuit Panel.
L31 To terminal 5 of terminal board B4.
L32 To terminal 1 of terminal board B7.
L33 To terminal 6 of terminal board B4.
L34 To L30.
L35 To L39.
L36 To terminal 3 of terminal board B2.
L37 To A.O.T. (blue lead).
L38 To terminal 4 of range switch WS1.
L39 To L35, to terminal 3 of range switch WS1 and to terminal 3 of contrast control VR8.
L40 To A.O.T. (red lead) and terminal 1 of capacitor E2.
L41 Sound alignment test point.
L42 To terminal 4 of terminal board B4.
L43 To terminal 5 of terminal board B2.
L44 To pin 7 of crt socket.
L45 To terminal 2 of capacitor E2.
L46 To terminal 3 of capacitor E1.
L47 To terminal 5 of volume control VR8.
L48 To terminal 4 of tone control VR7 and terminal 6 of volume control VR8.
L49 To L21 of Deflection Perma-Circuit Panel.


S11
6BQ5
SOUND OUT
S9
12AT7
SYNC SEP
AND N.I.
6CS6 SND. DISC S12
S13 SND. I.F. AMP 6BY8
S10
12BV7
VIDEO OUT

TERMINAL LUG IDENTIFICATION—DEFLECTION PERMA-CIRCUIT PANEL

L8 To L30 on Video-Sound Perma-Circuit Panel.
L9 Test point, horizontal oscillator.
L10 To terminal 1 of capacitor E2.
L11 To terminal 4 of terminal board B4.
L12 To terminal 7 of terminal board B2.
L13 To terminal 3 of terminal board B5.
L14 To terminal 1 of vertical hold control, VR4.
L15 To L25.
L16 To H.O.T., low side.
L17 To H.O.T.
L18 Not used.
L19 To terminal 3 of capacitor E2.
L20 To terminal 2 of capacitor E2.
L21 To L49 on Video-Sound Perma-Circuit Panel and terminal 2 of brightness control, VR6.
L22 To terminal 1 of brightness control, VR6.
L23 To V.O.T.
L24 To terminal 3 of horizontal hold, VR5.
L25 To L15.
L26 To terminal 4 of terminal board B2.

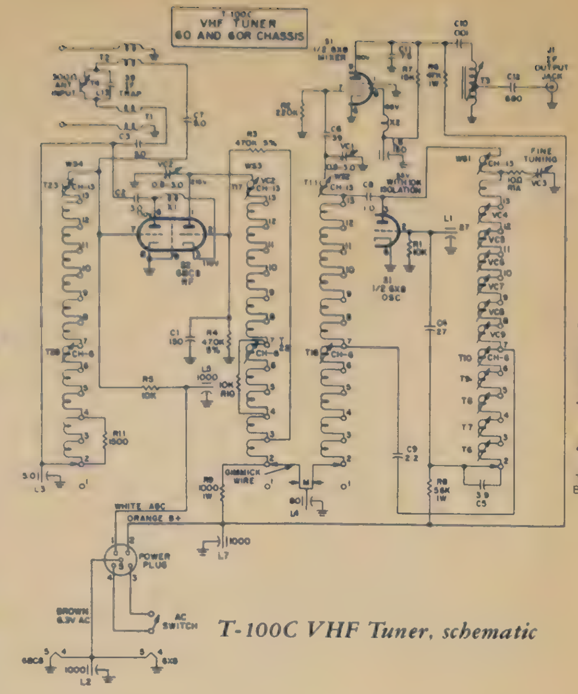

VERT. OUT. S7 6DT5
VERT. LIN
HEIGHT
AUX HORIZ FREQ
WIDTH
S4
6CG7
VERT. OSC
S5
6CG7
HORIZ. OSC.
VR1
VR2
VR3
S8
6AU4
DAMP
S6
6DQ6A



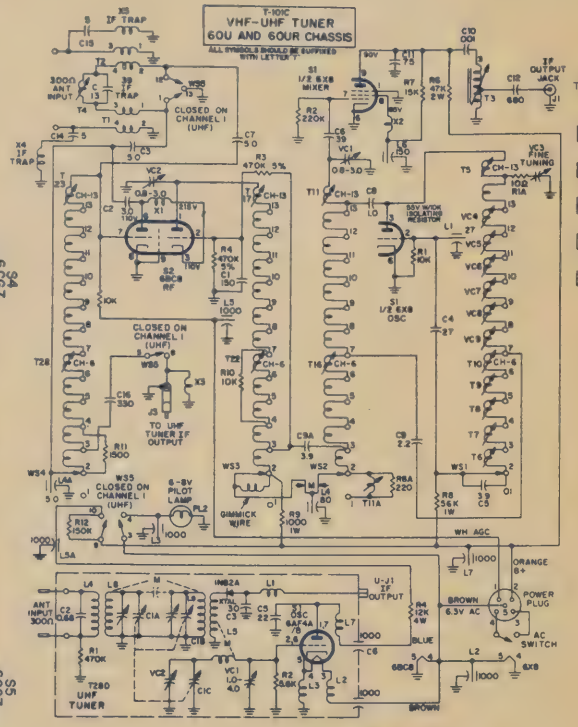
Overall r-f, i-f response curve

PHILCO
TV Chassis 10L60,
10L60U, 10L60R, 10L60UR

Electronic Technician
CIRCUIT DIGEST
520

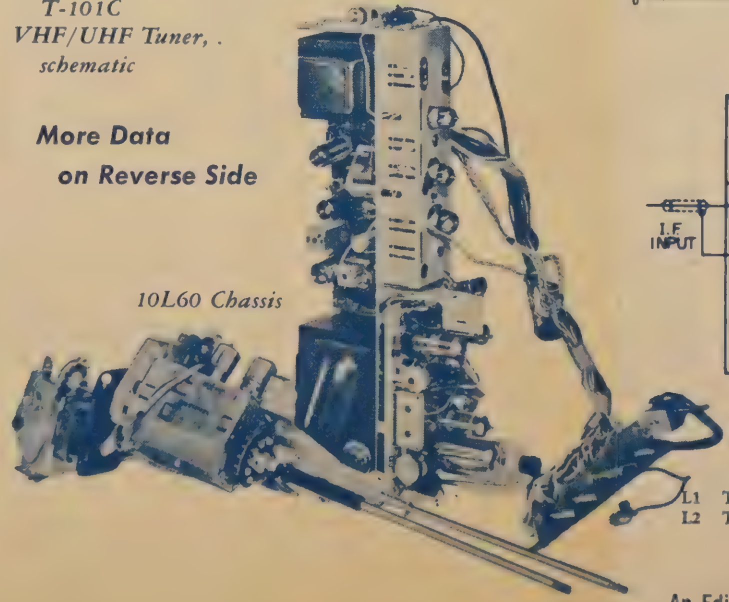

T-100C
VHF TUNER
60 AND 60R CHASSIS
POWER PLUG
AC SWITCH
GIMMICK WIRE
WHITE AGC
ORANGE B+
BROWN 6.3V AC

T-100C VHF Tuner, schematic

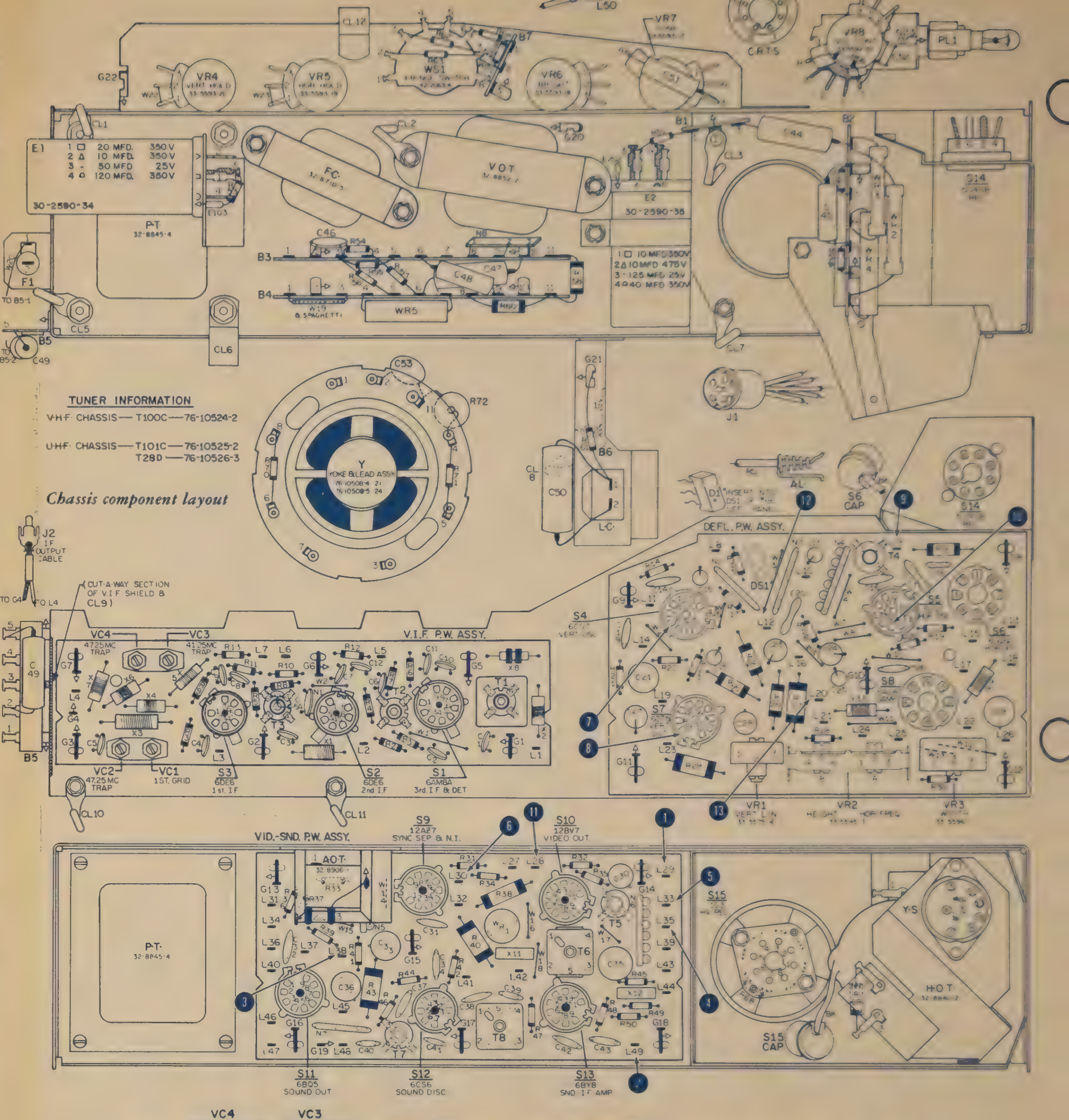

T-101C
VHF-UHF TUNER
60U AND 60UR CHASSIS
ALL SYMBOLS SHOULD BE SUFFIXED WITH LETTER "A"
IF TRAP
CLOSED ON CHANNEL 1 (UHF)
IF OUTPUT JACK
FINE TUNING
6-8V PILOT LAMP
GIMMICK WIRE
TO UHF TUNER IF OUTPUT
T28D
UHF TUNER
6AF4A
POWER PLUG
AC SWITCH

T-101C VHF/UHF Tuner, schematic

More Data on Reverse Side



10L60 Chassis

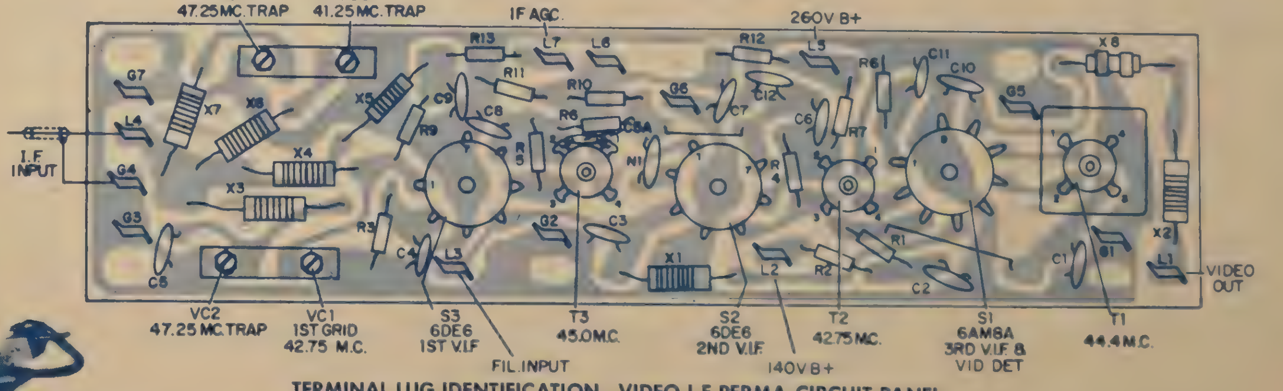

E1
1 □ 20 MFD. 350V
2 △ 10 MFD. 350V
3 - 50 MFD. 25V
4 ○ 120 MFD. 380V
30-2590-34
P-T
32-8845-4
F1
FC
VOT
E2
30-2590-38
1□ 10 MFD 350V
2△ 10 MFD 475V
3- 125 MFD 25V
4○ 40 MFD 350V
VR4
VR5
VR6
VR7
VR8
CRTS
PL1
L50
CUT-A-WAY SECTION OF V.I.F. SHIELD & CL9
J2
I F OUTPUT CABLE
Y
YOKE & LEAD ASSY
V.I.F. P.W. ASSY.
VC4 47.25MC TRAP
VC3 41.25MC TRAP
VC2 47.25MC TRAP
VC1 1ST GRID
S3 6DE6 1st I.F.
S2 6DE6 2nd I.F.
S1 6AM8A 3rd I.F. & DET
DEFL. P.W. ASSY.
VR1 VERT. LIN
VR2 HEIGHT HOR FREQ
VR3 WIDTH
VID.-SND. P.W. ASSY.
S9 12AT7 SYNC SEP & N.I.
S10 12BV7 VIDEO OUT
S11 6BQ5 SOUND OUT
S12 6CS6 SOUND DISC
S13 6BY8 SND. I.F. AMP
S15 CAP
H-O.T.
AOT

TUNER INFORMATION

V·H·F· CHASSIS—T100C—76-10524-2

U·H·F· CHASSIS—T101C—76-10525-2
T28D—76-10526-3

Chassis component layout


VC4
47.25MC. TRAP
VC3
41.25MC. TRAP
IF AGC.
260V B+
I.F. INPUT
VIDEO OUT
VC2
47.25 MC. TRAP
VC1
1ST GRID
42.75 M.C.
S3
6DE6
1ST V.I.F.
FIL. INPUT
T3
45.0M.C.
S2
6DE6
2ND V.I.F.
140V B+
T2
42.75 M.C.
S1
6AM8A
3RD V.I.F. &
VID DET
T1
44.4 M.C.

TERMINAL LUG IDENTIFICATION—VIDEO I-F PERMA-CIRCUIT PANEL

L1 To L29 on Video-Sound Perma-Circuit Panel
L2 To terminal 1 of capacitor E1
L3 To terminal 3 of terminal board B5
L4 To tuner plug
L5 To terminal 4 of capacitor E1
L6 To terminal 3 of terminal board B1
L7 To terminal 6 of terminal board B4

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ELECTRONIC TECHNICIAN CIRCUIT DIGEST 521

RCA
TV Chassis 128A, B, C, E, F, H, J, M, U, AA, AB

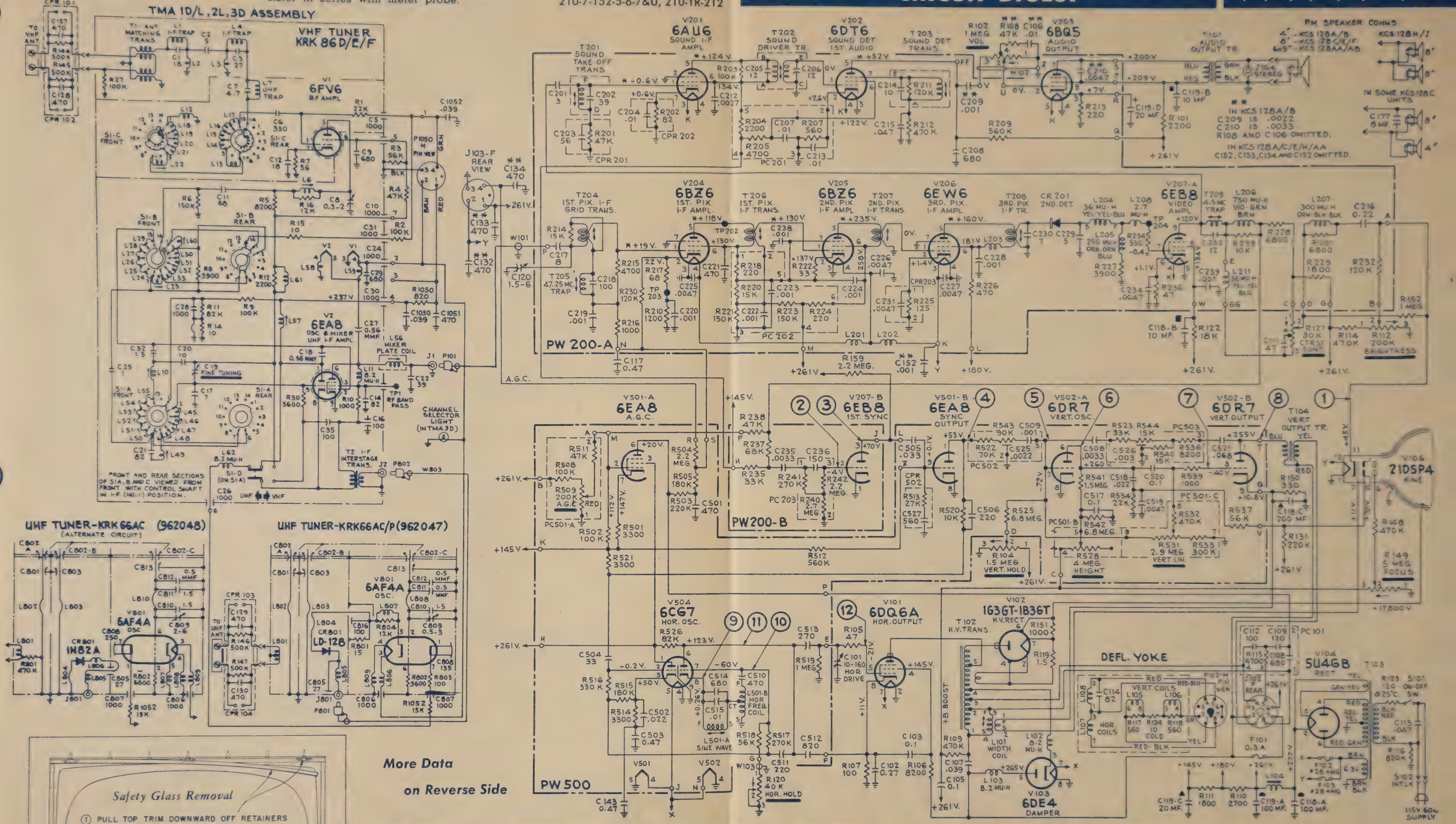
All resistance value in ohms. K = 1000.

All capacitance values less than 1 in MF and above 1 in MMF unless otherwise noted.

All voltages measured with "Volt-Ohmyst" and with no signal input. Voltages should hold within ±20% with 117 v. a-c supply.

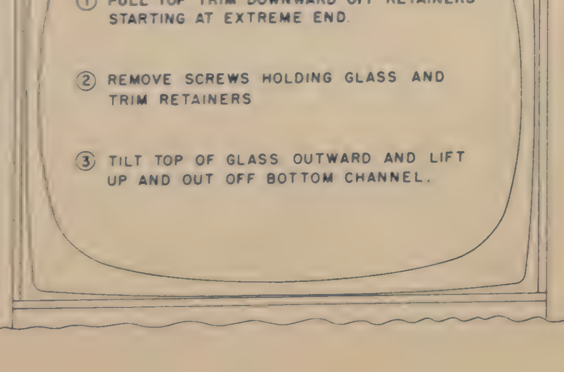
*Measured with 1 megohm, ½ watt resistor in series with meter probe.

Models 210-K-295&U, 210-K-296,
210-K-297&U, 210-K-299,
210-K-335-6-7&U, 210-K-356&7,
210-K-390&4, 210-K-415-6-7&U,
210-KR-435&6, 210-KR-455-6-7,
210-7-152-5-6-7&U, 210-TR-212



TMA 1D/L, 2L, 3D ASSEMBLY
VHF TUNER KRK 86 D/E/F
V1 6FV6 RF AMPL
V2 6EA8 OSC & MIXER UHF I-F AMPL
C19 FINE TUNING
FRONT AND REAR SECTIONS OF S1-A, B AND C VIEWED FROM FRONT WITH CONTROL SHAFT IN I-F (NO. 1) POSITION.
UHF TUNER-KRK66AC (962048) (ALTERNATE CIRCUIT)
UHF TUNER-KRK66AC/P (962047)
V801 6AF4A OSC
CR801 1N82A
CR801 LD-128
V201 6AU6 SOUND I-F AMPL
T201 SOUND TAKE-OFF TRANS
T202 SOUND DRIVER TR.
V202 6DT6 SOUND DET 1ST AUDIO
T203 SOUND DET TRANS
R102 1 MEG VOL
V203 6BQ5 AUDIO OUTPUT
T101 AUDIO OUTPUT TR
PM SPEAKER CONNS
IN KCS 128A/B C209 .0022 C210 .0033 R108 AND C106 OMITTED.
IN KCS 128 A/C/E/H/AA C132, C133, C134 AND C152 OMITTED.
T204 1ST. PIX. I-F GRID TRANS.
V204 6BZ6 1ST. PIX. I-F AMPL.
T206 1ST. PIX. I-F TRANS.
V205 6BZ6 2ND. PIX. I-F AMPL.
T207 2ND. PIX. I-F TRANS.
V206 6EW6 3RD. PIX. I-F AMPL.
T208 3RD. PIX I-F TR.
CR201 2ND. DET.
V207-A 6EB8 VIDEO AMPL.
T205 47.25 MC TRAP
PW 200-A
R127 CTRST
R112 200K BRIGHTNESS
V501-A 6EA8 A.G.C.
V207-B 6EB8 1ST. SYNC
PW200-B
V501-B 6EA8 SYNC OUTPUT
V502-A 6DR7 VERT. OSC.
V502-B 6DR7 VERT. OUTPUT
T104 VERT. OUTPUT TR.
V106 21DSP4 KINE
R104 1.5 MEG VERT. HOLD
R528 4 MEG HEIGHT
R531 2.9 MEG VERT LIN
R149 5 MEG FOCUS
V504 6CG7 HOR. OSC.
L501-B HOR FREQ COIL
L501-A SINE WAVE
R120 40K HOR. HOLD
PW 500
V101 6DQ6A HOR. OUTPUT
C101 10-160 HOR DRIVE
T102 H.V. TRANS.
V102 1G3GT-1B3GT H.V. RECT.
DEFL. YOKE
L101 WIDTH COIL
V103 6DE4 DAMPER
V104 5U4GB RECT
F101 0.3A
115V 60~ SUPPLY
S102 INTLK
+261 V.
+145 V.
+17600 V

More Data on Reverse Side

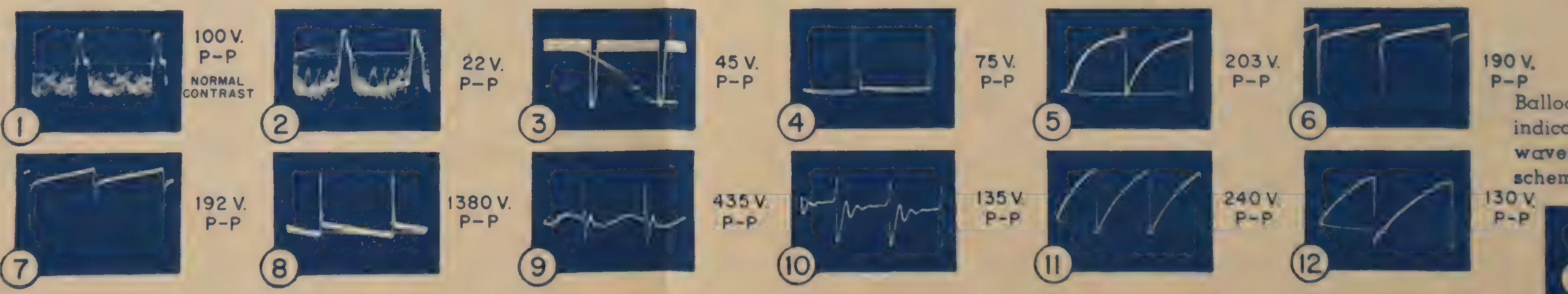


Safety Glass Removal

① PULL TOP TRIM DOWNWARD OFF RETAINERS STARTING AT EXTREME END.

② REMOVE SCREWS HOLDING GLASS AND TRIM RETAINERS

③ TILT TOP OF GLASS OUTWARD AND LIFT UP AND OUT OFF BOTTOM CHANNEL.



Balloons ①② etc., shown on schematics indicate points of observation of the waveforms shown below the individual schematic.

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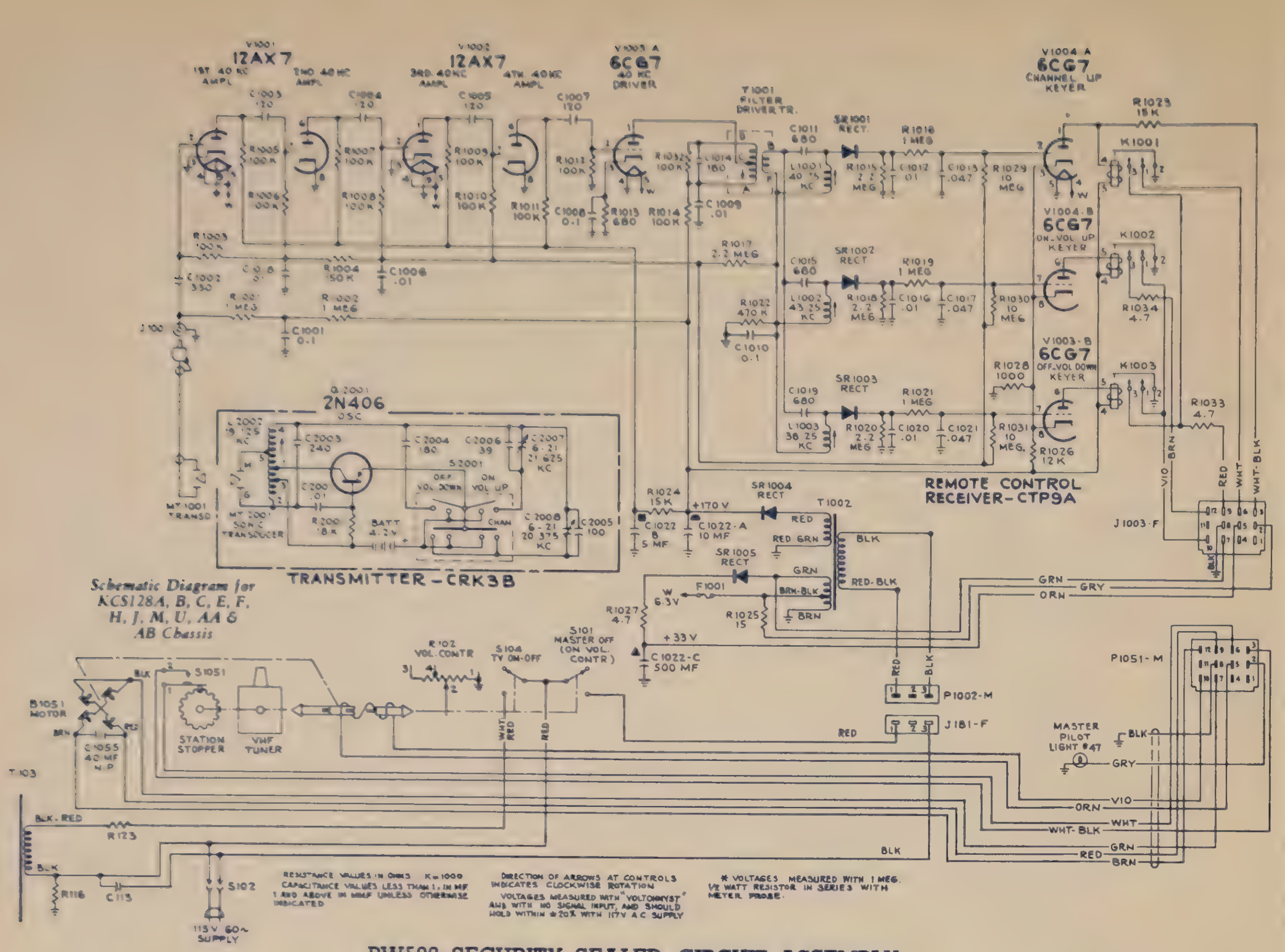
September • 1959


V1001 12AX7 1ST 40 KC AMPL
2ND 40 KC AMPL
V1002 12AX7 3RD 40 KC AMPL
4TH 40 KC AMPL
V1003-A 6CG7 40 KC DRIVER
T1001 FILTER DRIVER TR.
V1004-A 6CG7 CHANNEL UP KEYER
V1004-B 6CG7 ON. VOL. UP KEYER
V1003-B 6CG7 OFF. VOL DOWN KEYER
REMOTE CONTROL RECEIVER-CTP9A
Q2001 2N406 OSC
TRANSMITTER-CRK3B
MT1001 TRANSD
MT2001 SONIC TRANSDUCER
T1002
J1003-F
B1051 MOTOR
STATION STOPPER
VHF TUNER
R102 VOL CONTR
S104 TV ON-OFF
S101 MASTER OFF (ON VOL. CONTR)
P1002-M
J1181-F
P1051-M
MASTER PILOT LIGHT #47
S102
115 V 60~ SUPPLY

Schematic Diagram for KCS128A, B, C, E, F, H, J, M, U, AA & AB Chassis

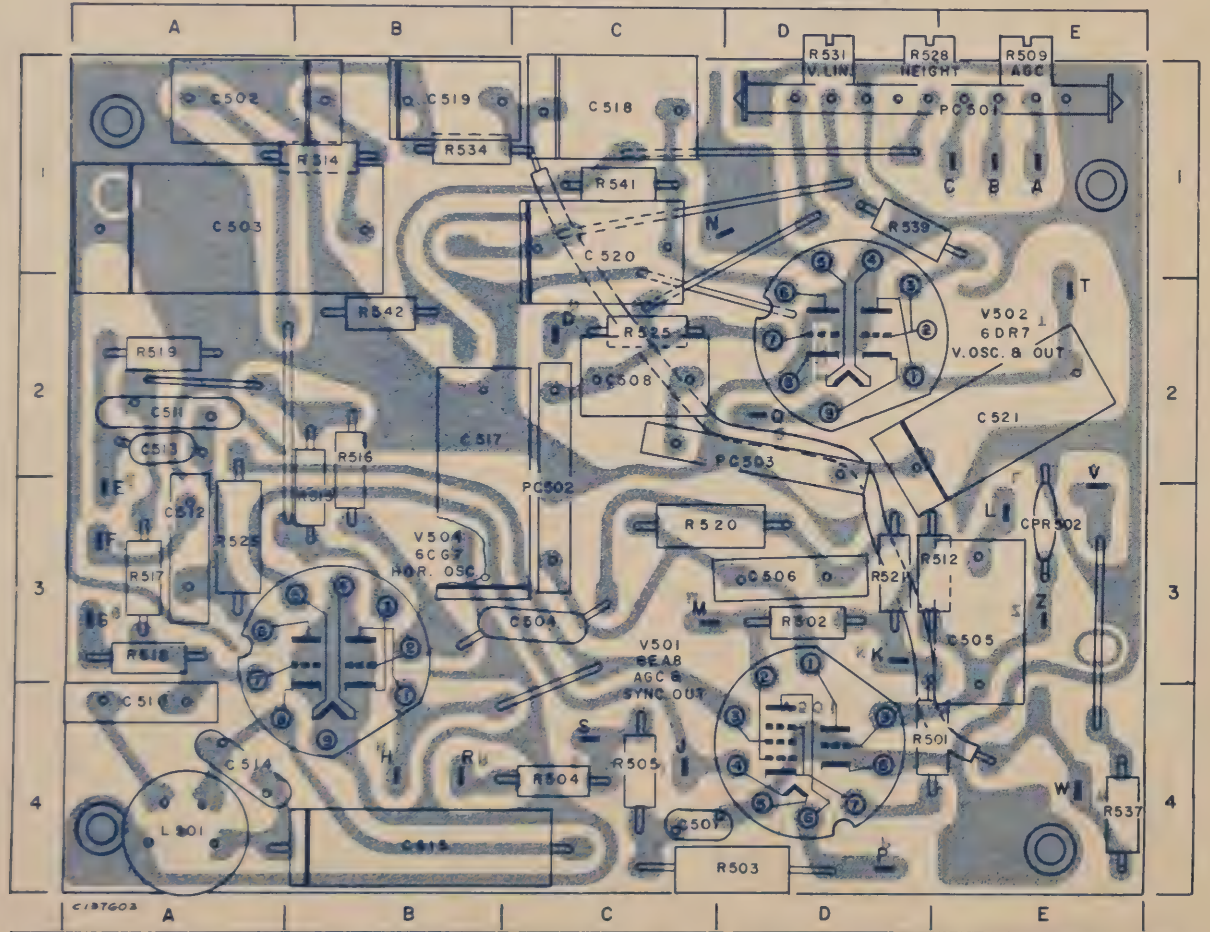
RESISTANCE VALUES IN OHMS K=1000 CAPACITANCE VALUES LESS THAN 1, IN MF. 1 AND ABOVE IN MMF UNLESS OTHERWISE INDICATED

DIRECTION OF ARROWS AT CONTROLS INDICATES CLOCKWISE ROTATION

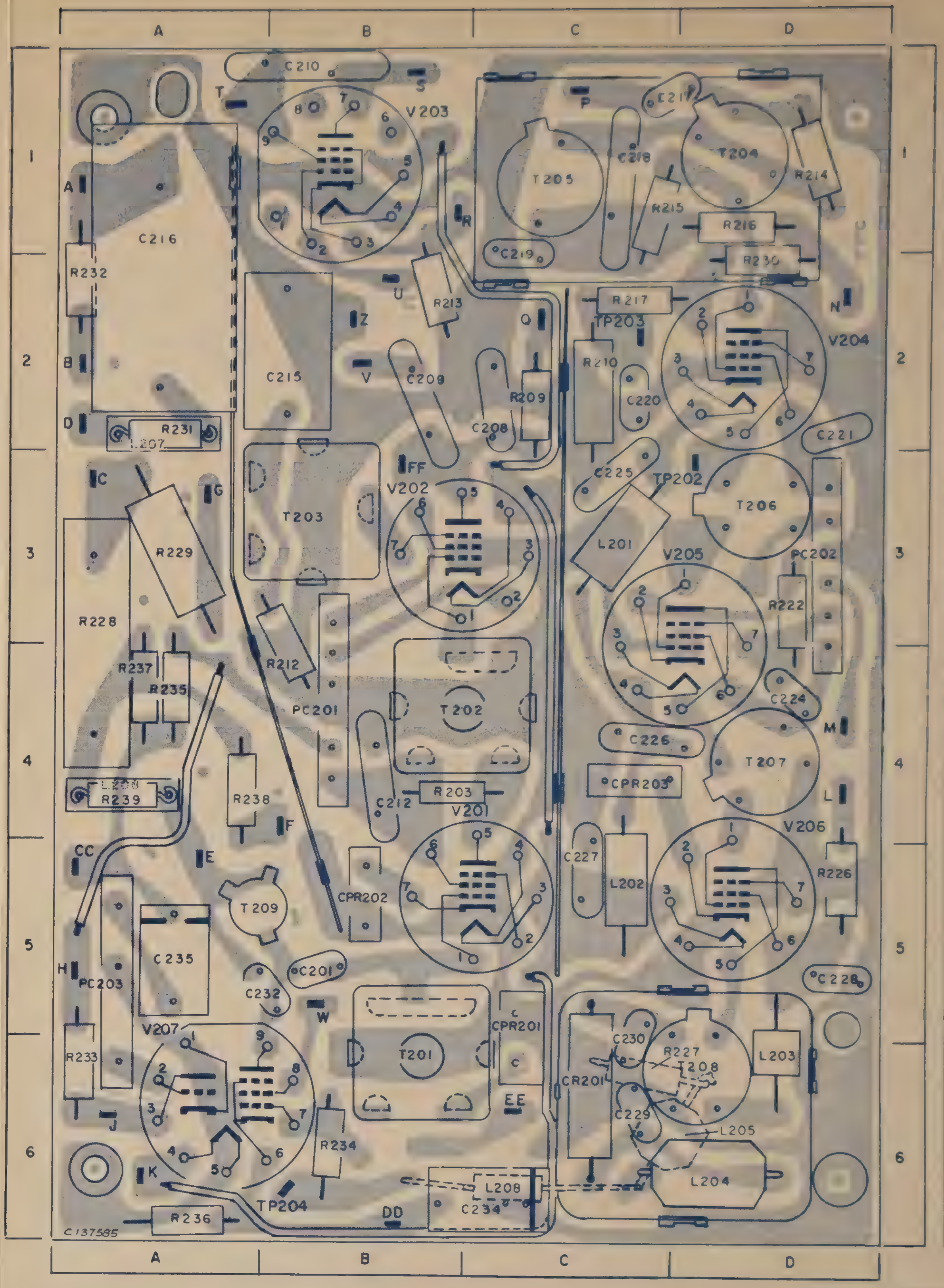
VOLTAGES MEASURED WITH "VOLTOHMYST" AND WITH NO SIGNAL INPUT, AND SHOULD HOLD WITHIN ±20% WITH 117V AC SUPPLY

* VOLTAGES MEASURED WITH 1 MEG. 1/2 WATT RESISTOR IN SERIES WITH METER PROBE.

PW500 SECURITY SEALED CIRCUIT ASSEMBLY


A
B
C
D
E
1
2
3
4
R531 V.LIN
R528 HEIGHT
R509 AGC
V502 6DR7 V. OSC. & OUT
V504 6CG7 HOR. OSC
V501 6EA8 AGC & SYNC OUT
C137603

C501 ..... C4	C508 ..... C2	C515 ..... B4	CPR502 .. E3	PC503 .... D2	R505 ..... C4	R518 ..... A3	R534 ..... B1
C502 ..... A1	C510 ..... A4	C517 ..... B2			R512 ..... D3	R519 ..... A2	R537 ..... E4
C503 ..... A1	C511 ..... A2	C518 ..... C1	L501 ..... A4	R501 ..... D4	R514 ..... B1	R520 ..... C3	R539 ..... D1
C504 ..... C3	C512 ..... A3	C519 ..... B1		R502 ..... D3	R515 ..... B3	R521 ..... D3	R541 ..... C1
C505 ..... E3	C513 ..... A2	C520 .. C1	PC501 .... D1	R503 ..... D4	R516 ..... B2	R525 ..... C2	R542 ..... B2
C506 ..... D3	C514 ..... A4	C521 ..... E2	PC502 .... C3	R504 ..... C4	R517 ..... A3	R526 ..... A3	


A
B
C
D
1
2
3
4
5
6
V201
V202
V203
V204
V205
V206
V207
T201
T202
T203
T204
T205
T206
T207
T208
T209
C137585

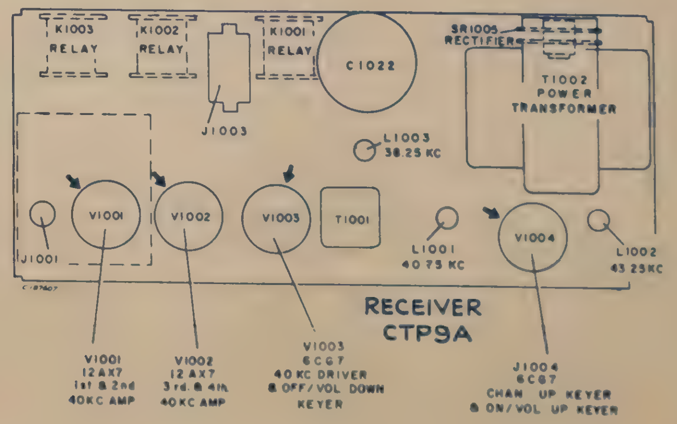
PW200 COMPONENT LOCATION GUIDE

C201	B5
C208	C2
C209	B2
C210	B1
C212	B4
C215	B2
C216	A1
C217	C1
C218	C1
C219	C1
C220	C2
C221	D2
C224	D4
C225	C3
C226	C4
C227	C5
C228	D5
C229	C6
C230	C5
C232	B5
C234	C6
C235	A5
C238	D3
C239	A6
CPR201	C5
CPR202	B5
CPR203	C4
CR201	C6
L201	C3
L202	C5
L203	D6
L204	D6
L205	D6
L206	A4
L207	A2
L208	C6
PC201	B4
PC202	D3
PC203	A5
R203	B4
R209	C2
R210	C2
R212	B3
R213	B2
R214	D1
R215	C1
R216	D1
R217	C2
R222	D3
R226	D5
R227	C6
R228	A4
R229	A3
R230	D1
R231	A2
R232	A2
R234	B6
R235	A4
R236	A6
R237, R238,	
R239	A4
R243	B2
T201	B6
T202	C4
T203	B3
T204	D1
T205	C1
T206	D3
T207	D4
T208	D6
T209	A5

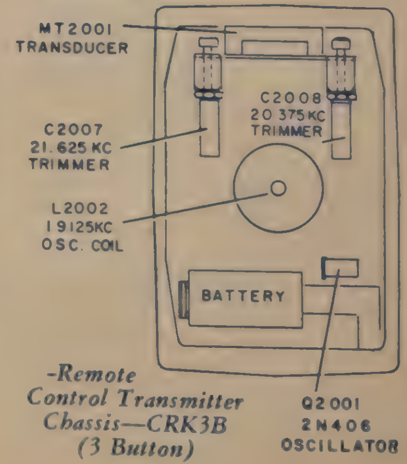
RCA
TV Chassis 128A, B, C, E, F, H, J, M, U, AA, AB

Electronic Technician
CIRCUIT DIGEST
521

More Data on Reverse Side


K1003 RELAY
K1002 RELAY
K1001 RELAY
C1022
SR1005 RECTIFIER
T1002 POWER TRANSFORMER
J1003
L1003 38.25 KC
J1001
V1001
V1002
V1003
T1001
L1001 40.75 KC
V1004
L1002 43.25 KC
V1001 12AX7 1st & 2nd 40KC AMP
V1002 12AX7 3rd & 4th 40KC AMP
V1003 6CG7 40KC DRIVER & OFF/VOL DOWN KEYER
J1004 6CG7 CHAN UP KEYER & ON/VOL UP KEYER

RECEIVER CTP9A


MT2001 TRANSDUCER
C2007 21.625 KC TRIMMER
L2002 19125KC OSC. COIL
C2008 20.375KC TRIMMER
BATTERY
Q2001 2N406 OSCILLATOR

-Remote Control Transmitter Chassis—CRK3B (3 Button)

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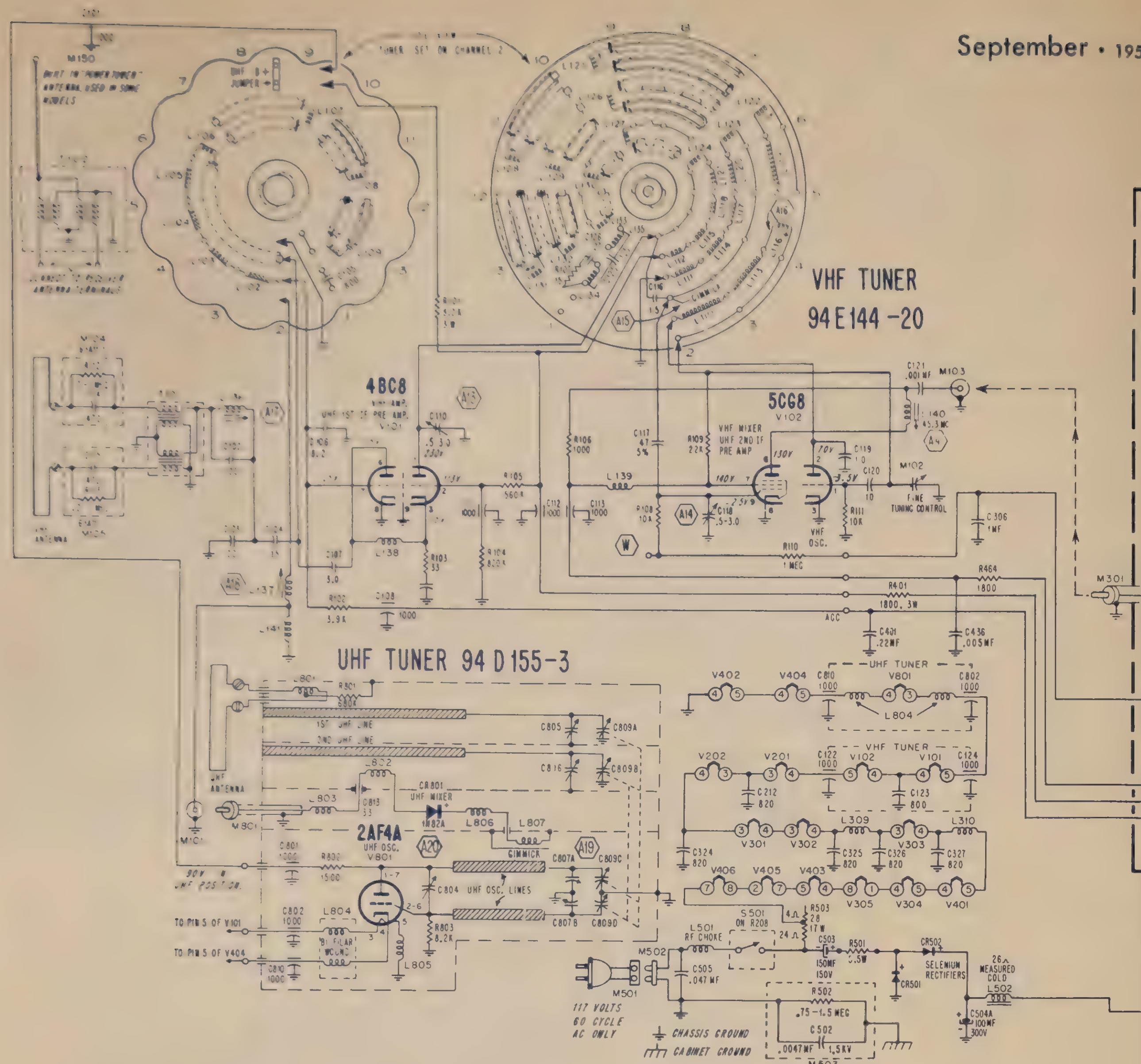
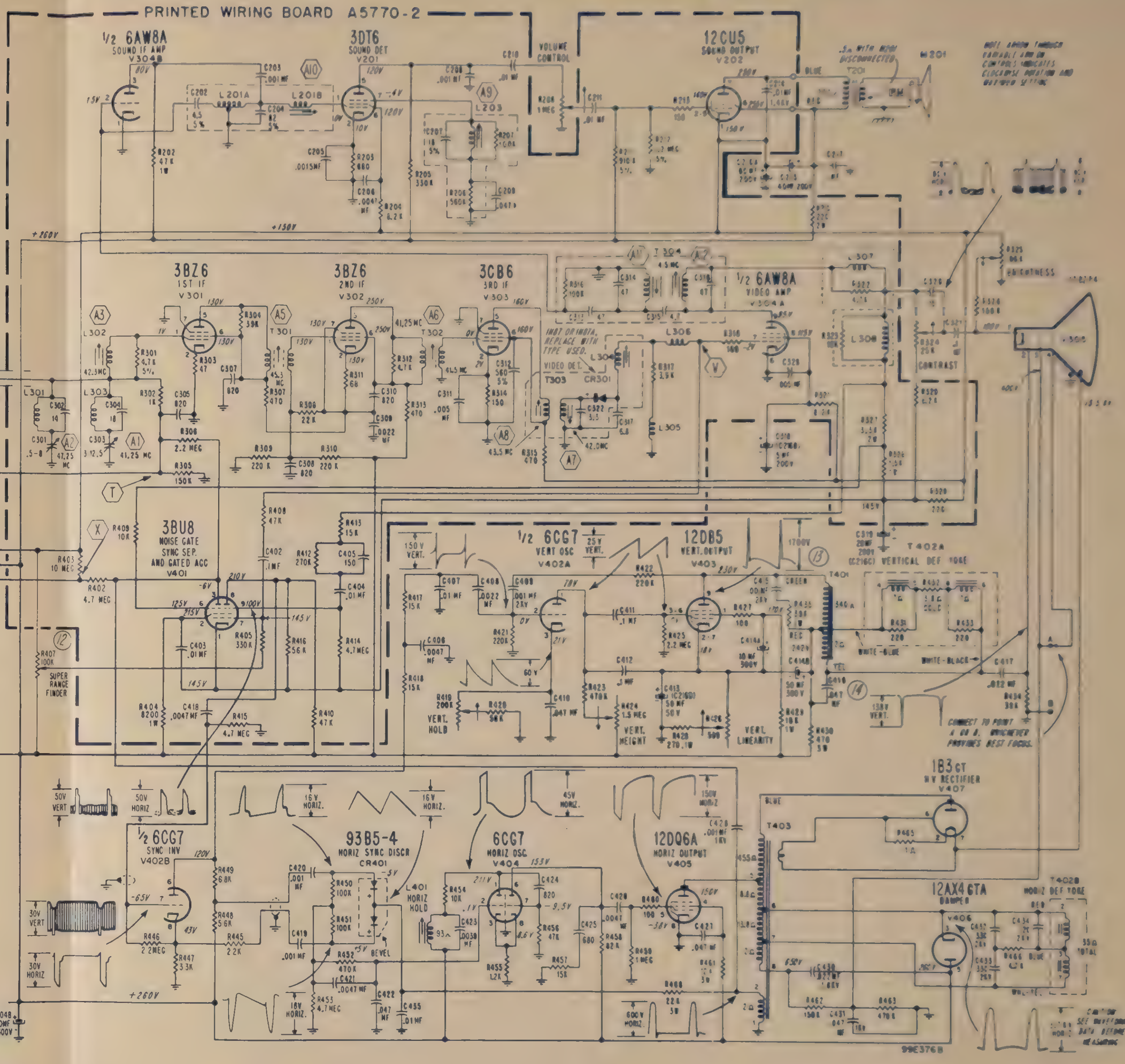
September • 1959

ELECTRONIC TECHNICIAN CIRCUIT DIGEST 522

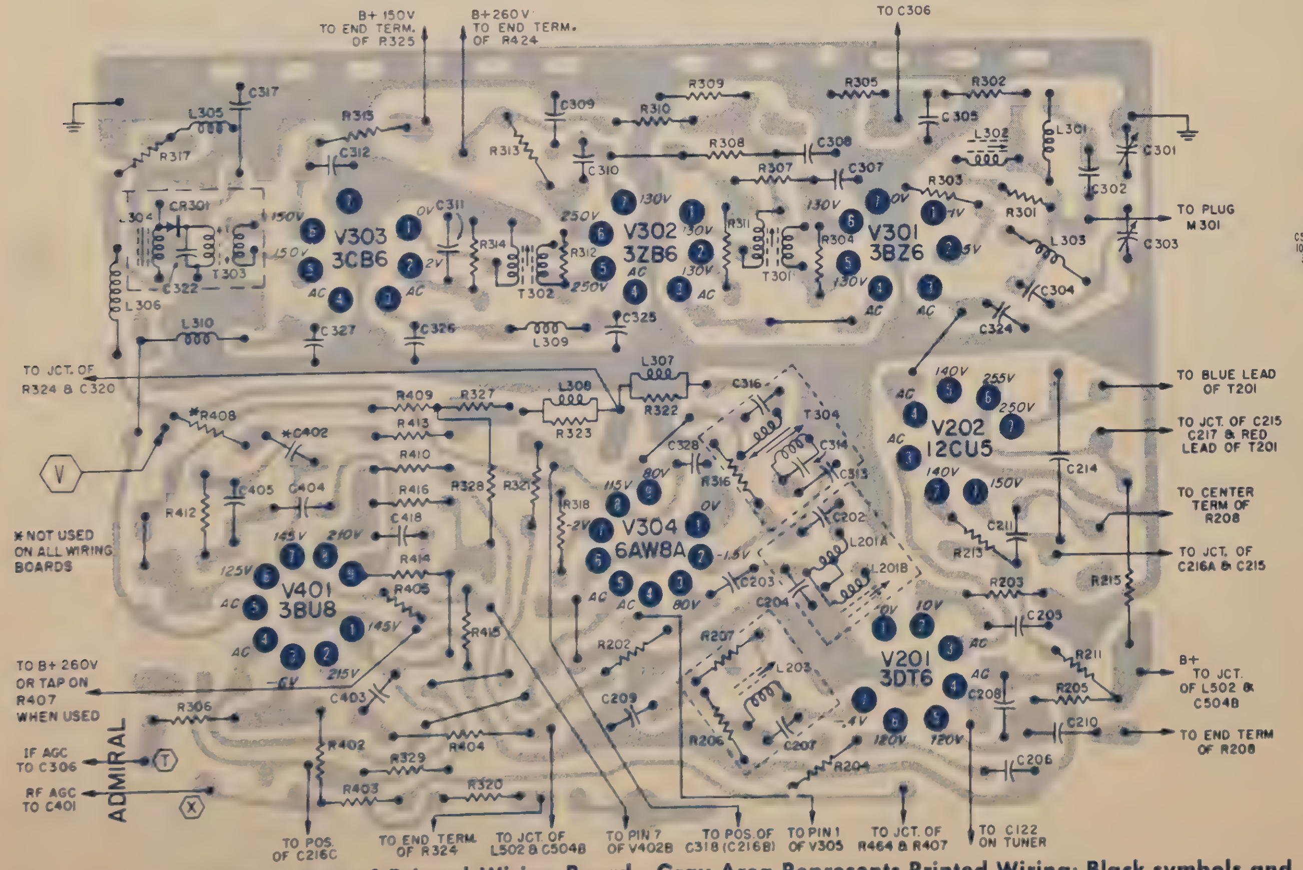
ADMIRAL
TV Chassis 16X1, 16AX1



VHF TUNER
94 E 144 -20
UHF TUNER 94 D 155-3
4BC8
5CG8
V102
2AF4A
UHF OSC.
V801
M103
M150
M301
M501
M502
M503
63 B 10 -3
117 VOLTS
60 CYCLE
AC ONLY
CHASSIS GROUND
CABINET GROUND
SELENIUM RECTIFIERS
FINE TUNING CONTROL
VHF OSC.
VHF MIXER UHF 2ND IF PRE AMP
UHF ANTENNA
VHF ANTENNA
TUNER SET ON CHANNEL 2
TO PIN 5 OF V101
TO PIN 5 OF V404

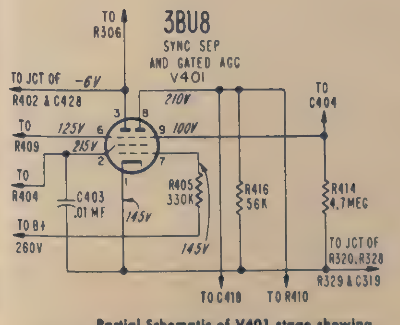


PRINTED WIRING BOARD A5770-2
1/2 6AW8A
SOUND IF AMP
V304B
3DT6
SOUND DET
V201
VOLUME CONTROL
12CU5
SOUND OUTPUT
V202
T201
M201
3BZ6
1ST IF
V301
3BZ6
2ND IF
V302
3CB6
3RD IF
V303
1/2 6AW8A
VIDEO AMP
V304A
BRIGHTNESS
CONTRAST
VIDEO DET.
CR301
3BU8
NOISE GATE
SYNC SEP
AND GATED AGC
V401
SUPER RANGE FINDER
1/2 6CG7
VERT OSC
V402A
VERT. HOLD
12DB5
VERT. OUTPUT
V403
VERT. HEIGHT
VERT. LINEARITY
T401
T402A
VERTICAL DEF YOKE
1B3GT
HV RECTIFIER
V407
1/2 6CG7
SYNC INV
V402B
93B5-4
HORIZ SYNC DISCR
CR401
6CG7
HORIZ OSC
V404
HORIZ HOLD
12DQ6A
HORIZ OUTPUT
V405
T403
12AX4GTA
DAMPER
V406
T402B
HORIZ DEF YOKE
99E376B



B+ 150V TO END TERM. OF R325
B+ 260V TO END TERM. OF R424
TO C306
TO PLUG M301
V303 3CB6
V302 3ZB6
V301 3BZ6
TO JCT. OF R324 & C320
TO BLUE LEAD OF T201
TO JCT OF C215 C217 & RED LEAD OF T201
TO CENTER TERM OF R208
TO JCT. OF C216A & C215
V202 12CU5
V304 6AW8A
V401 3BU8
V201 3DT6
*NOT USED ON ALL WIRING BOARDS
TO B+ 260V OR TAP ON R407 WHEN USED
IF AGC TO C306
RF AGC TO C401
ADMIRAL
B+ TO JCT. OF L502 & C504B
TO END TERM OF R208
TO POS. OF C216C
TO END TERM. OF R324
TO JCT OF L502 & C504B
TO PIN 7 OF V402B
TO POS. OF C318 (C216B)
TO PIN 1 OF V305
TO JCT. OF R464 & R407
TO C122 ON TUNER

View of Wiring Side of Printed Wiring Board. Gray Area Represents Printed Wiring; Black symbols and lines represent components and connections on opposite side.



3BU8
SYNC SEP AND GATED AGC
V401
TO R306
TO JCT OF -6V R402 & C428
TO R409
TO R404
TO B+ 260V
TO C404
R405 330K
R416 56K
R414 4.7MEG
C403 .01 MF
TO JCT OF R320 R328
R329 & C319
TO C418
TO R410

Partial Schematic of V401 stage showing Runs 10 and 11 connection in Chassis 16AX1 and Run 11 connection in Chassis 16X1.

PRODUCTION CHANGES

CHANGE TO PREVENT HORIZONTAL SYNC INSTABILITY AT HIGH SIGNAL LEVELS

16AX1 Chassis Stamped Run 11

To reduce possibility of horizontal sync overload and resulting Horizontal oscillator instability at extremely high signal level, C401 changed to .22MF.

DIFFERENT CIRCUIT FOR V401 STAGE USED

16X1 and 16AX1 Chassis Stamped Run 12

To improve rejection of external noise interference, R408 (47K), C402 (.1MF) and Super Range Finder control R407 (100K) added.

CHANGE IN VERTICAL OUTPUT CIRCUIT

16X1 and 16AX1 Chassis Stamped Run 13

To reduce pulse voltage at V403, a series network consisting of C415 (.001MF, 2KV) and R435 (39K, 1W) added from pin 9 of V403 to red lead of Vertical Output transformer (T401). C416 (.047MF) removed.

CHANGE TO MINIMIZE HORIZONTAL PULSE INTERACTION IN VERTICAL OUTPUT CIRCUIT

16X1 and 16AX1 Chassis Stamped Run 14

C416 (.047MF, 600V) added between red and yellow leads of Vertical Output Transformer (T401) to minimize Horizontal pulse interaction in Vertical Output circuit.

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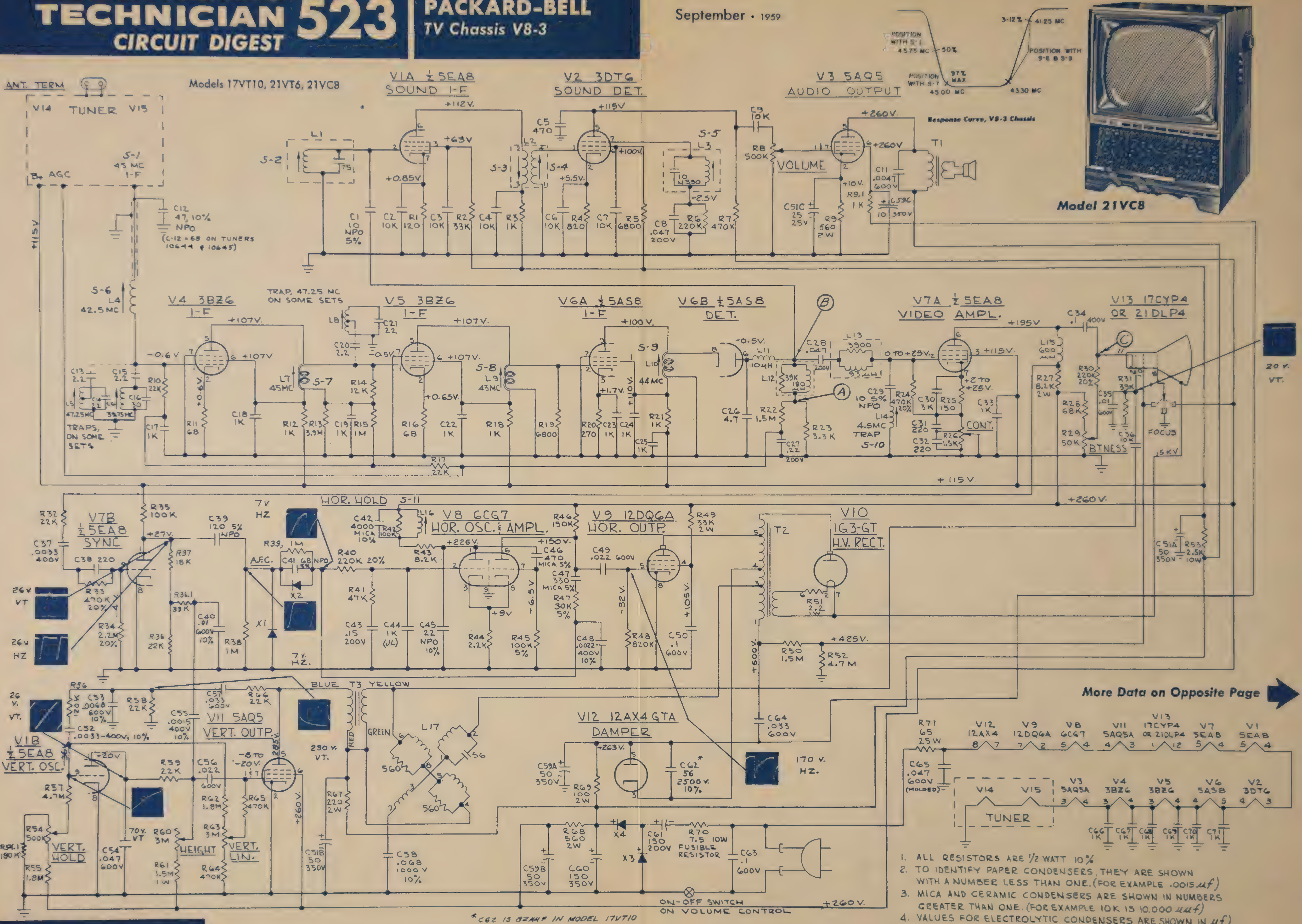
ELECTRONIC TECHNICIAN CIRCUIT DIGEST 523

PACKARD-BELL
TV Chassis V8-3

September • 1959

Models 17VT10, 21VT6, 21VC8


Response Curve, V8-3 Chassis

Model 21VC8

POSITION WITH S-1 45.75 MC
50%
POSITION WITH S-7 45.00 MC
97% MAX
3-12% 41.25 MC
POSITION WITH S-6 & S-9
43.30 MC
ANT. TERM
V14 TUNER V15
S-1 45 MC I-F
B+ AGC
+115V
C12 47, 10% NPO (C-12 = 68 ON TUNERS 10644 & 10645)
S-6 L4 42.5 MC
V1A ½ 5EA8 SOUND I-F
V2 3DT6 SOUND DET.
V3 5AQ5 AUDIO OUTPUT
S-2
S-3
S-4
S-5 L3
C9 10K
R8 500K VOLUME
T1
C11 .0047 600V
C59C 10 350V
R9 560 2W
C5IC 25 25V
R9.1 1K
C1 10 NPO 5%
C8 .047 200V
R6 220K
R7 470K
V4 3BZ6 I-F
V5 3BZ6 I-F
TRAP, 47.25 MC ON SOME SETS
TRAPS, ON SOME SETS
47.25MC
39.75MC
L7 45MC S-7
S-8 L9 43MC
V6A ½ 5AS8 I-F
V6B ½ 5AS8 DET.
S-9 L10 44MC
L11 104H
L13 3900
C28 .047 200V
R23 3.3K
C27 .22 200V
V7A ½ 5EA8 VIDEO AMPL.
L14 4.5MC TRAP S-10
C34 .1 400V
L15 600 μH
V13 17CYP4 OR 21DLP4
R30 220K 20%
R31 39K
R29 50K BT'NESS
R26 1.5K CONT.
FOCUS
15KV
20 V. VT.
+115 V.
+260 V.
R32 22K
V7B ½ 5EA8 SYNC
R35 100K
C39 120 5% NPO
7V HZ
HOR. HOLD S-11
V8 6CG7 HOR. OSC. & AMPL.
V9 12DQ6A HOR. OUTP.
V10 1G3-GT H.V. RECT.
T2
R49 33K 2W
C51A 50 350V
R53 2.5K 10W
A.F.C.
X1
X2
R39, 1M
R40 220K 20%
R41 47K
C43 .15 200V
C44 1K (UL)
C45 22 NPO 10%
R44 2.2K
R45 100K 5%
R47 30K 5%
C48 .0022 400V 10%
R48 820K
C50 .1 600V
R50 1.5M
R52 4.7M
+425V.
+600V.
26V VT
26V HZ
7V. HZ.
R33 470K 20%
R34 2.2M 20%
R36 22K
R36.1 33K
C40 .01 600V 10%
R38 1M
C37 .0033 400V
C38 220
BLUE T3 YELLOW
GREEN
RED
L17
560
56
26 V. VT.
V1B ½ 5EA8 VERT. OSC.
V11 5AQ5 VERT. OUTP.
230 V. VT.
R56
C53 .0068 600V 10%
R58 22K
C55 .0015 400V 10%
C57 .033 600V
R66 22K
C52 .0033-400V, 10%
R57 4.7M
R59 2.2K
C56 .022 600V
R62 1.8M
R63 3M
R65 470K
R60 3M HEIGHT
R64 470K VERT. LIN.
R54 500K VERT. HOLD
R54.1 180K
R55 1.8M
C54 .047 600V
70V. VT
R61 1.5M 1W
R67 220 2W
C51B 50 350V
C58 .068 1000 V 10%
V12 12AX4 GTA DAMPER
+263V.
C59A 50 350V
R69 100 2W
C62* 56 2500V. 10%
170 V. HZ.
C64 .033 600V
R68 560 2W
X4
X3
C61 150 200V
R70 7.5 10W FUSIBLE RESISTOR
C63 .1 600V
C59B 50 350V
C60 150 350V
ON-OFF SWITCH ON VOLUME CONTROL
+260 V.
R71 65 25W
C65 .047 600V (MOLDED)
V12 12AX4
V9 12DQ6A
V8 6CG7
V11 5AQ5A
V13 17CYP4 OR 21DLP4
V7 5EA8
V1 5EA8
V14 V15 TUNER
V3 5AQ5A
V4 3BZ6
V5 3BZ6
V6 5AS8
V2 3DT6
A
B
C

*C62 IS 82μμf IN MODEL 17VT10

More Data on Opposite Page

NOTES
UNLESS OTHERWISE SPECIFIED

1. ALL RESISTORS ARE ½ WATT 10%
2. TO IDENTIFY PAPER CONDENSERS, THEY ARE SHOWN WITH A NUMBER LESS THAN ONE. (FOR EXAMPLE .0015 μf)
3. MICA AND CERAMIC CONDENSERS ARE SHOWN IN NUMBERS GREATER THAN ONE. (FOR EXAMPLE 10K IS 10,000 μμf)
4. VALUES FOR ELECTROLYTIC CONDENSERS ARE SHOWN IN μf)
5. VOLTAGES ARE MEASURED WITH NO SIGNAL.
6. SWEEP FREQUENCY (HORIZ. OR VERT.) AND PEAK TO PEAK VOLTAGE GIVEN BY WAVEFORM PHOTO.

CAUTION, HOT CHASSIS
Chassis is connected to one side of AC line.
Use an isolation transformer to connect power to set.
Do not plug two sets into the same transformer.

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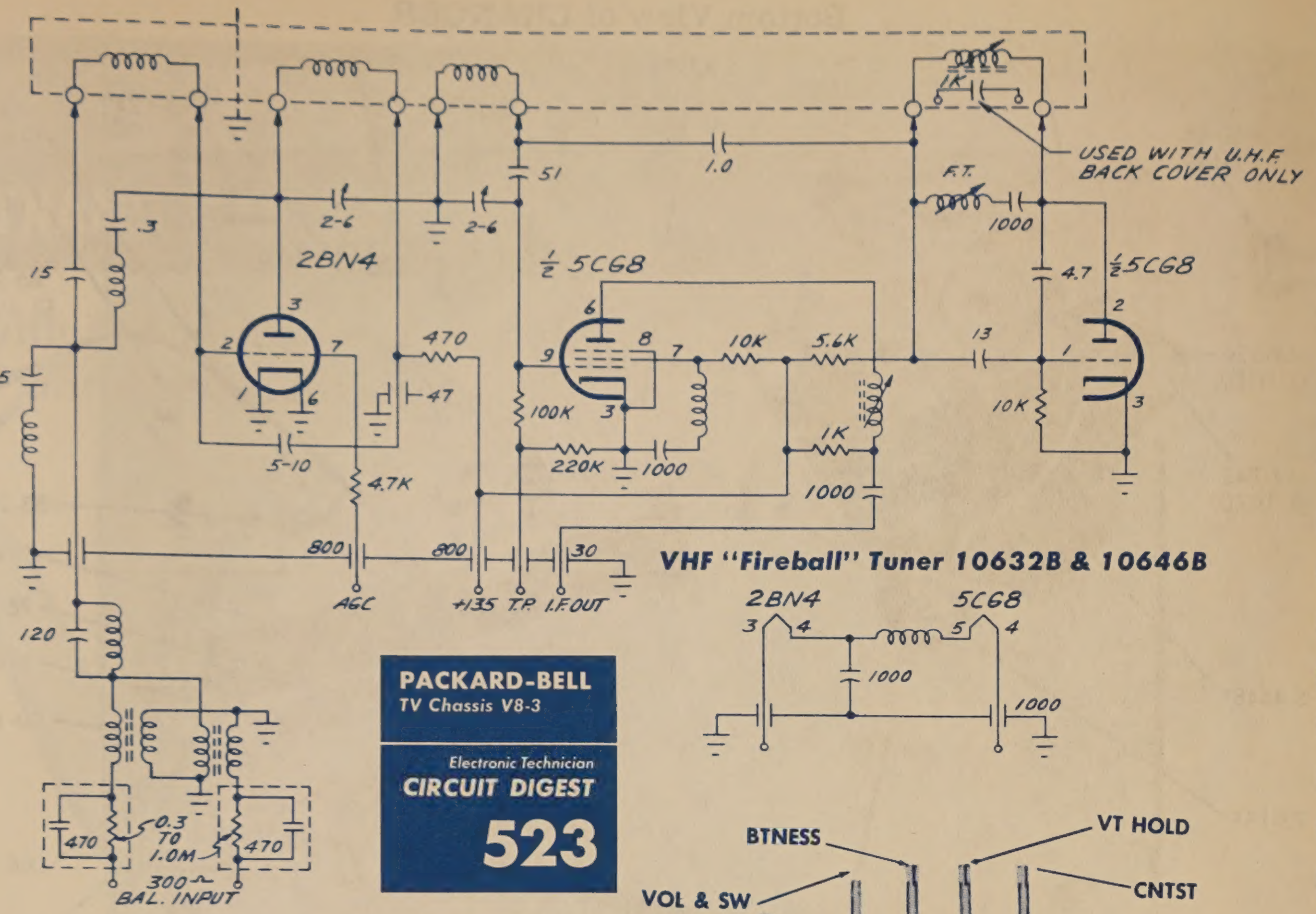
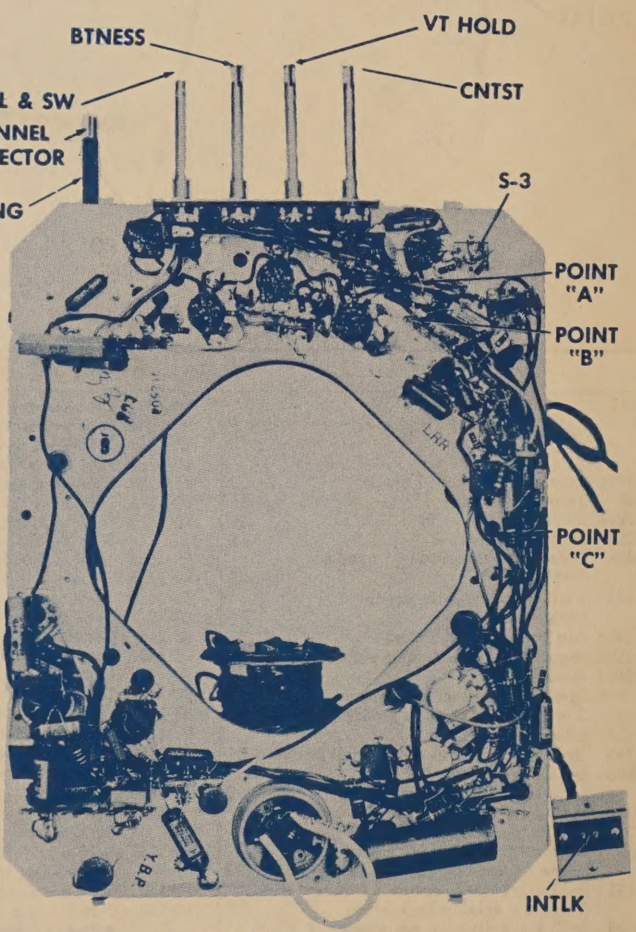


USED WITH U.H.F. BACK COVER ONLY
1K
F.T.
1000
.51
1.0
2-6
2-6
.3
15
15
2BN4
½ 5CG8
½ 5CG8
470
47
100K
10K
5.6K
13
10K
4.7
5-10
4.7K
220K
1000
1K
1000
800
800
30
120
AGC
+135
T.P.
I.F. OUT
.470
.470
0-3 TO 1.0M
300~ BAL. INPUT
2BN4
5CG8
1000
1000

VHF "Fireball" Tuner 10632B & 10646B

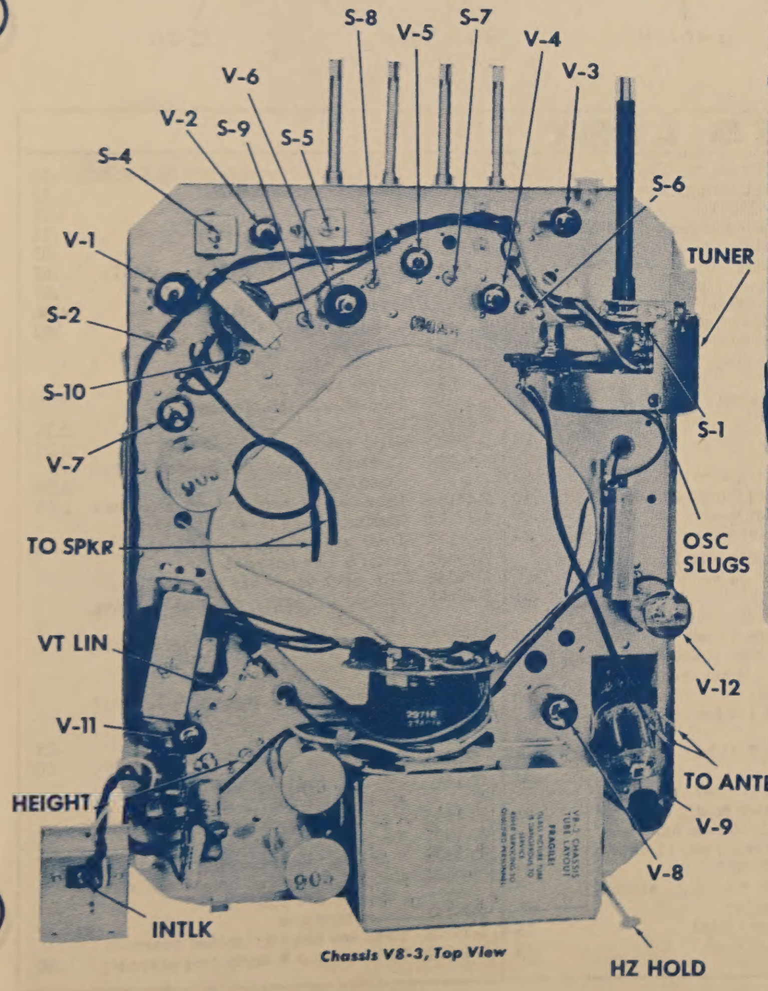
PACKARD-BELL
TV Chassis V8-3

Electronic Technician
CIRCUIT DIGEST
523



BTNESS
VT HOLD
VOL & SW
CNTST
CHANNEL SELECTOR
FINE-TUNING
S-3
POINT "A"
POINT "B"
POINT "C"
INTLK

Chassis V8-3, Bottom View



S-8
V-5
S-7
V-4
V-6
V-3
V-2
S-9
S-5
S-4
S-6
V-1
TUNER
S-2
S-10
S-1
V-7
TO SPKR
OSC SLUGS
VT LIN
V-12
V-11
TO ANTENNA
HEIGHT
V-9
V-8
INTLK
HZ HOLD

Chassis V8-3, Top View

LIST OF ADJUSTMENTS:

S-1	I-F on RF tuner
S-2	Sound take-off, 4.50 mc
S-3	Primary, sound I-F, 4.50 mc (bottom)
S-4	Secondary, sound I-F, 4.50 mc (top)
S-5	Quadrature coil
S-6	1st picture I-F
S-7	2nd picture I-F
S-8	3rd picture I-F
S-9	4th picture I-F
S-10	Trap, 4.50 mc
S-11	Horizontal hold

More Data on Opposite Page

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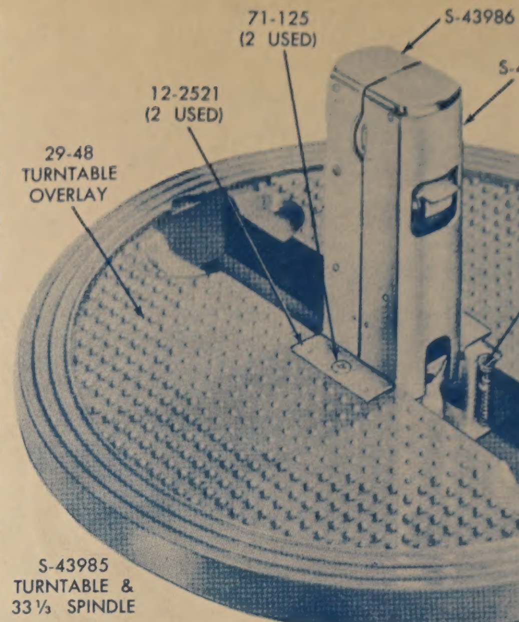
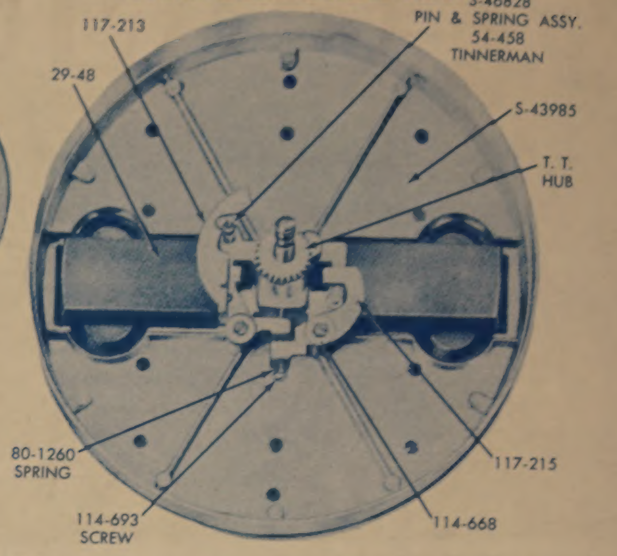
TURNTABLE - Top View

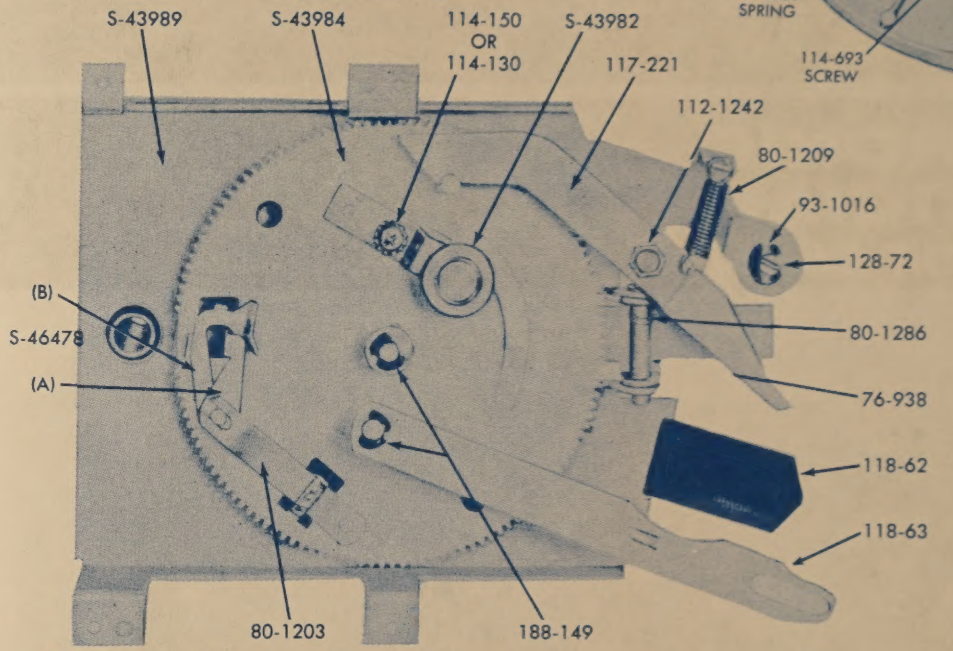


71-125 (2 USED)
S-43986
S-43987
12-2521 (2 USED)
S-46828 PIN & SPRING ASSY. 80-1197 SPRING
29-48 TURNTABLE OVERLAY
S-43985 TURNTABLE & 33⅓ SPINDLE

TURNTABLE - Bottom View



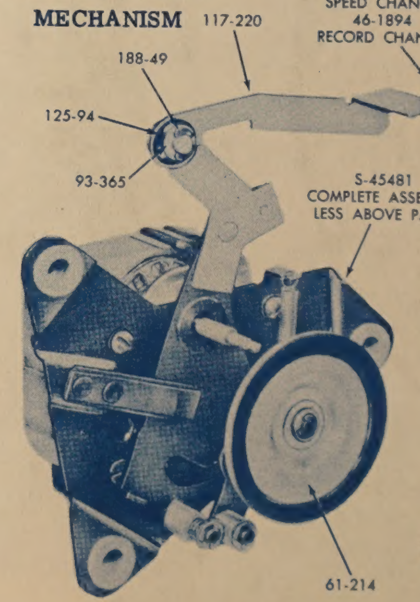
S-46828 PIN & SPRING ASSY. 54-458 TINNERMAN
117-213
29-48
S-43985
T. T. HUB
80-1260 SPRING
114-693 SCREW
114-668
117-215



S-43989
S-43984
114-150 OR 114-130
S-43982
117-221
112-1242
80-1209
93-1016
128-72
(B)
S-46478
(A)
80-1286
76-938
118-62
118-63
80-1203
188-149

CYCLING MECHANISM - Bottom View

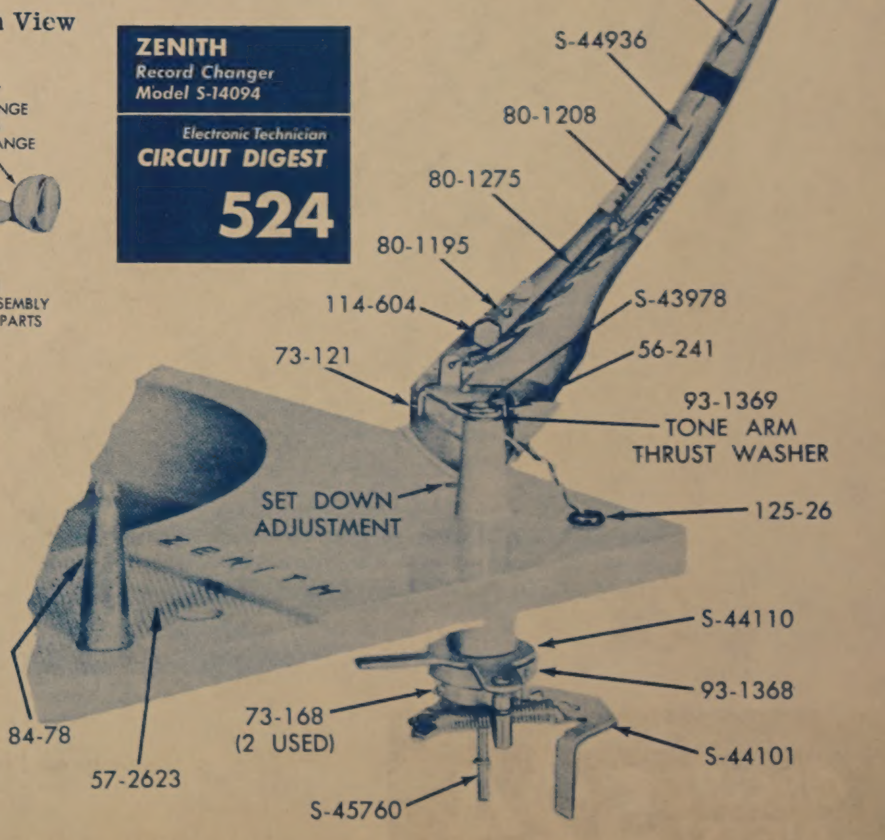
SPEED CHANGE MECHANISM



117-220
46-2107 SPEED CHANGE
46-1894 RECORD CHANGE
188-49
125-94
93-365
S-45481 COMPLETE ASSEMBLY LESS ABOVE PARTS
61-214

ZENITH
Record Changer
Model S-14094

Electronic Technician
CIRCUIT DIGEST
524



56-405 SUB. 56-371
112-961
142-97
19-339
148-158
S-44936
80-1208
80-1275
80-1195
114-604
S-43978
73-121
56-241
93-1369 TONE ARM THRUST WASHER
SET DOWN ADJUSTMENT
125-26
S-44110
93-1368
73-168 (2 USED)
S-44101
84-78
57-2623
S-45760

September • 1959

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CIRCUIT DIGESTS

85

In This Issue (No. 85)

Circuit Digest No.

ADMIRAL 522
TV Chassis 16X1, 16AX1

PACKARD-BELL 523
TV Chassis V8-3
Models 17VT10, 21VT6, 21VC8

PHILCO 520
TV Chassis 10L60, 10L60U, 10L60R, 10L60UR

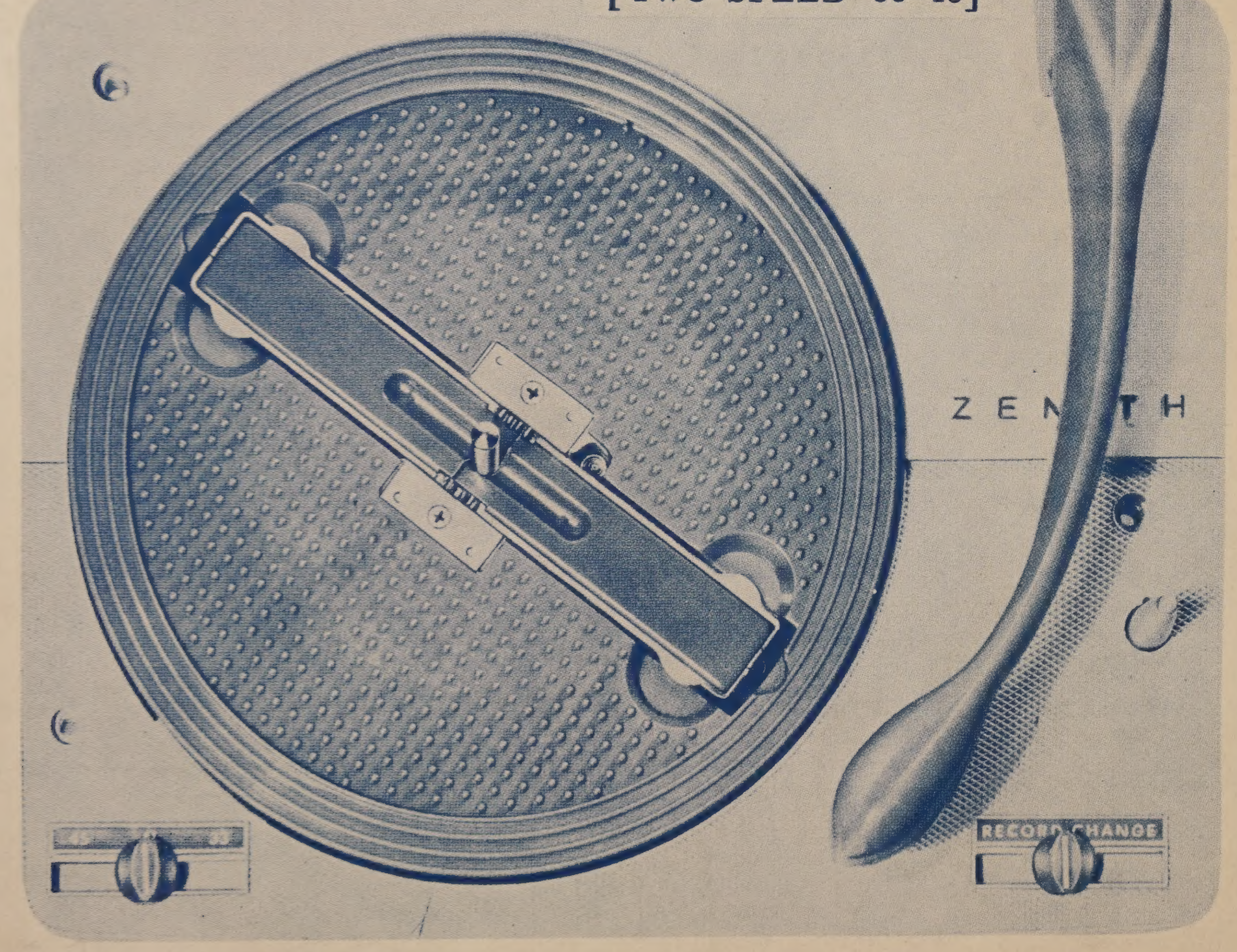
RCA 521
TV Chassis 128A, B, C, E, F, H, J, M, U, AA, AB
Models 210-K-295&U, 210-K-296, 210-K-297&U, 210-K-299, 210-K-335-6-7&U, 210-K-356&7, 210-K-390&4, 210-K-415-6-7&U, 210-KR-435&6, 210-KR-455-6-7, 210-7-152-5-6-7&U, 210-TR-212

ZENITH Record Changer 524
Model S-14094

ELECTRONIC TECHNICIAN CIRCUIT DIGEST 524

ZENITH
Record Changer Model S-14094

[TWO-SPEED 33-45]



Electronic Technician
CIRCUIT DIGEST 524

More Data on Reverse Side

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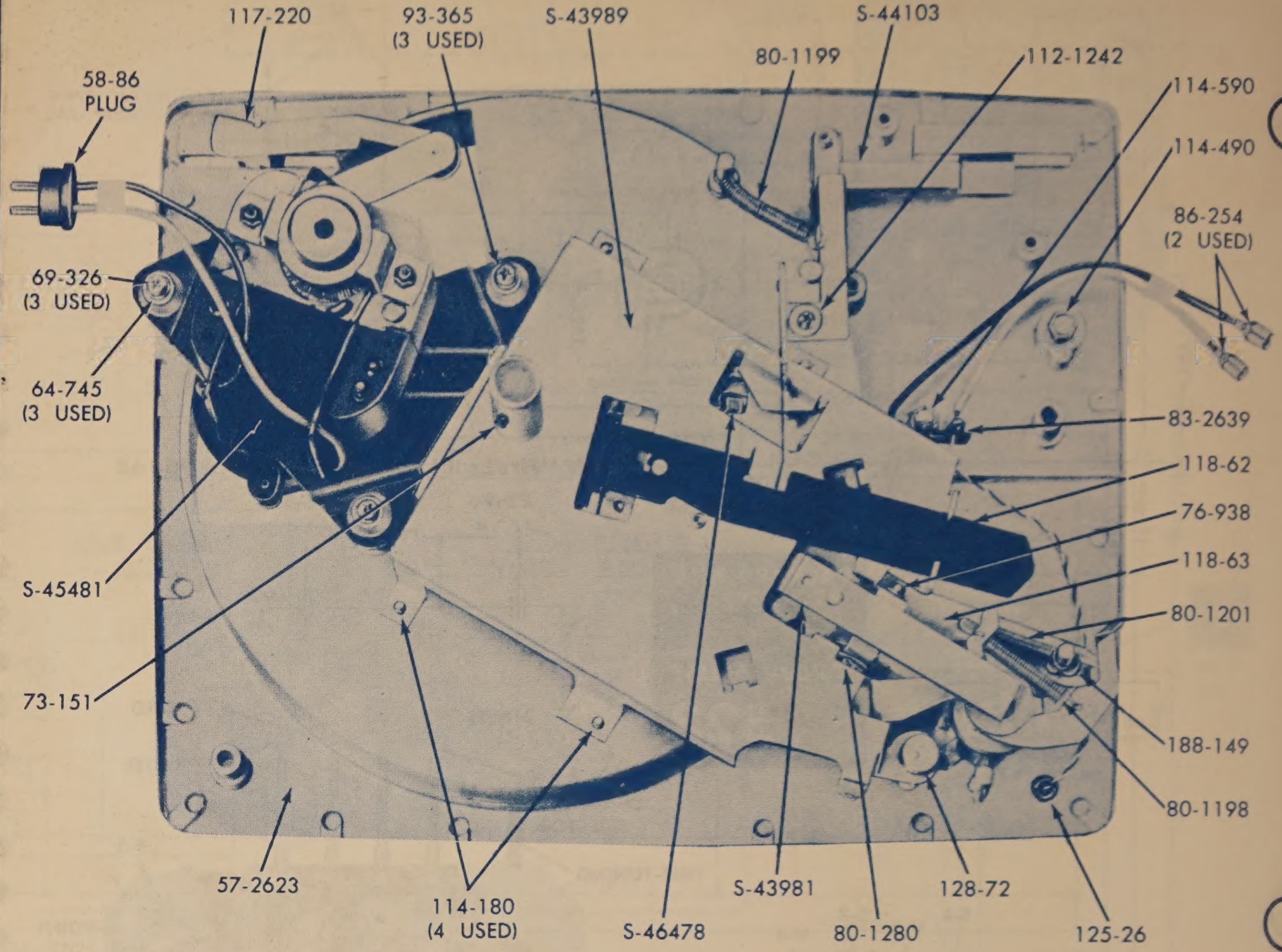
Bottom View of CHANGER



PARTS LIST

PART NO.	DESCRIPTION	PRICE
12-2521	Retaining bracket (2 used)	.25
29-48	Turntable overlay	1.35
46-1894	Record change knob	.25
46-2107	Speed change knob	.25
54-458	Speed nut - tinnerman (1 used on S-46828)	.05
56-405	1 mil. mfd. sapphire needle (sub. 56-371)	
57-2458	Arm cover plate (2 used)	1.35
57-2570	Record change indicator plate	.50
57-2623	Base plate	5.65
57-2625	Speed change indicator plate	.25
58-86	2 prong plug (used on S-45481)	.15
61-214	Idler wheel	
64-745	Brass eyelet (3 used on motor mount)	.03
69-326	6-32 x 5/8 phils. rd. hd. mach. screw (3 used on motor mount)	.05
69-352	4-40 x 5/32 rd. hd. mach. screw (2 used)	
71-125	4-40 x 9/32 phils. flat hd. mach. screw (1 used on ea. 12-2521)	.03
73-151	8-32 x 3/16 hex. socket set screw - Turntable spindle lock screw	.10
73-168	6-32 x 3/8 slab hd. set screw - cuppoint (2 part of S-44101)	.15
76-938	Lift lever pivot pin	.20
80-1196	Torsion spring (1 part of ea. S-43986 & S-43987)	.10
80-1197	Auto-manual pin spring (used on S-46828	.10
80-1198	Yoke spring	.15
80-1199	Coil spring (used on S-44103)	.15
80-1201	Throw-out link spring (used on 118-63)	.15
80-1203	Trip pawl spring (used on S-46478)	.10
80-1205	Index spring - left	.25
80-1206	Index spring - right	.25
80-1209	Brake spring (used on 117-221)	.15
80-1259	Support bracket spring (1 part of ea. S-43986 & S-43987)	.10
80-1260	Adj. screw spring (used on 114-693)	.05
80-1280	Retaining spring	.03
80-1286	Lift lever spring	.15
80-1312	Separator spring (1 part of ea. S-43986 & S-43987)	.15
80-1337	45 R.P.M. adaptor spring - 50 cycle	
80-1338	33 1/3 R.P.M. adaptor spring - 50 cycle	
83-2639	3 lug terminal strip	.05
84-78	Tone arm rest	.25
86-254	Connector terminal (2 used)	.05
93-365	13/64 x 3/8 x 1/32 steel washer (3 used)	.03
93-502	Lock washer	.03
93-1016	Spring washer (used on 128-72)	.03
93-1332	Spring washer (7 used as needed)	.10
93-1368	Tone arm shaft washer	.03
93-1369	Tone arm thrust washer	.03
112-1133	4-24 x 3/16 phils. pan hd. self-tap. screw (1 used on ea. 80-1205 & 80-1206)	.03
112-1242	4-24 x 3/16 phils. rd. hd. self-tap. screw - flat washer att.	.05
114-150	6/32 mach. screw (used on S-43984)	.03
114-180	6-20 x 1/4 x 1/4 hex. hd. self-tap. screw (4 used)	.03
114-342	6-20 x 3/16 x 1/4 hex. hd. self-tap. screw	.03
114-490	10-16 x 1/2 x 5/16 hex. hd. self-tap. screw	.03
114-590	6-32 x 3/16 x 1/4 hex. hd. mach. screw - flat washer att.	.03
114-668	4-40 x 1/4 x 3/16 hex. hd. mach. screw - flat washer att. (1 used on ea. 117-213 & 117-215)	.03
114-693	4/40 hex. slot. hd. mach. screw (used on 117-215)	.03
117-213	Actuating lever - right	.15
117-215	Actuating lever - left	.15
117-220	Motor control lever (used on S-45481)	.15
117-221	Brake detent lever	.15
118-62	Trip link	.25
118-63	Throw-out link	.15
125-26	Rubber grommet	.03
125-94	Rubber grommet (used on S-45481)	.03
128-72	Tone arm adj. cam	.85
142-97	Pickup cartridge	4.50
188-149	Retaining ring (5 used)	.03
S-43981	Lift lever	
S-43982	Ejector roller	
S-43984	Clutch gear	
S-43985	Turntable & spindle assembly	
S-43986	Left arm	2.25
S-43987	Right arm	2.25
S-43989	Turntable mtg. plate, bearing & stud assembly	3.25
S-44101	Tone arm bushing, yoke & set screw	1.10
S-44103	Record change lever assembly	
S-44110	Tone arm actuating lever & stud	.30
S-45481	Motor & link assembly	
S-45760	Lift pin & speed nut assembly	
S-46478	Trip pawl, friction pawl and bushing assembly	.30
S-46828	Auto-manual pin and spring assembly	

TONE ARM PARTS

PART NO.	DESCRIPTION	PRICE
19-339	Tone arm rest clip	.05
56-241	Swivel pivot pin	.10
73-121	4-40 x 1/4 allen hd. set screw special conepoint (used on 148-158)	.15
80-1195	Adj. screw spring (used on 114-604)	.15
80-1208	Tension adj. spring	.10
80-1275	Tone arm tension spring	.15
114-604	4-40 x 1/4 special height adj. screw (used on 148-158)	.05
148-158	Cobra tone arm	2.25
S-43978	Tone arm shaft & bracket assembly	
S-44936	Twisted wire & connector assembly	.50

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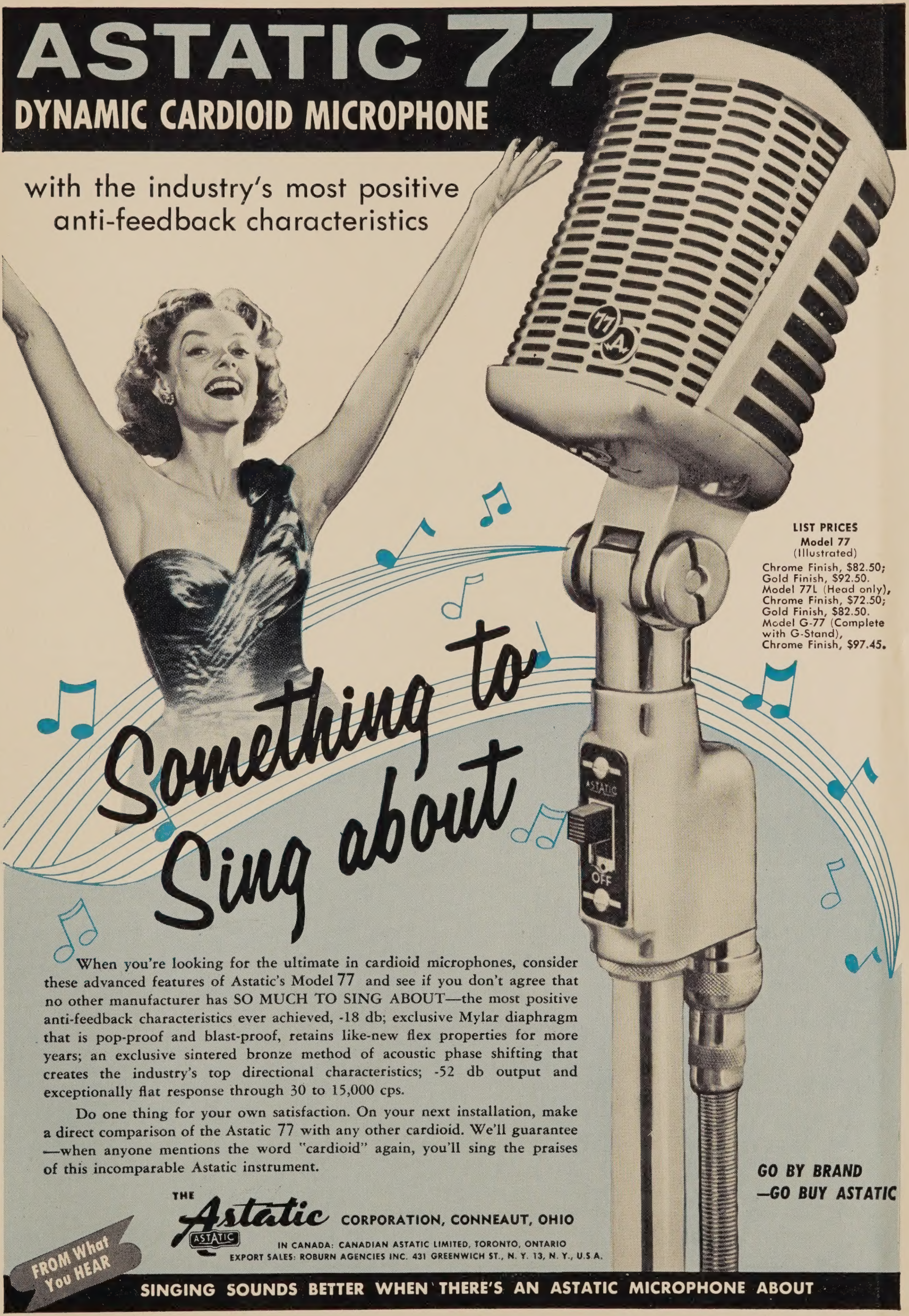


ASTATIC 77

DYNAMIC CARDIOID MICROPHONE

with the industry's most positive anti-feedback characteristics

LIST PRICES
Model 77
(Illustrated)
Chrome Finish, $82.50;
Gold Finish, $92.50.
Model 77L (Head only),
Chrome Finish, $72.50;
Gold Finish, $82.50.
Model G-77 (Complete with G-Stand),
Chrome Finish, $97.45.

When you're looking for the ultimate in cardioid microphones, consider these advanced features of Astatic's Model 77 and see if you don't agree that no other manufacturer has SO MUCH TO SING ABOUT—the most positive anti-feedback characteristics ever achieved, -18 db; exclusive Mylar diaphragm that is pop-proof and blast-proof, retains like-new flex properties for more years; an exclusive sintered bronze method of acoustic phase shifting that creates the industry's top directional characteristics; -52 db output and exceptionally flat response through 30 to 15,000 cps.

Do one thing for your own satisfaction. On your next installation, make a direct comparison of the Astatic 77 with any other cardioid. We'll guarantee —when anyone mentions the word "cardioid" again, you'll sing the praises of this incomparable Astatic instrument.

GO BY BRAND
—GO BUY ASTATIC

THE *Astatic* CORPORATION, CONNEAUT, OHIO
IN CANADA: CANADIAN ASTATIC LIMITED, TORONTO, ONTARIO
EXPORT SALES: ROBURN AGENCIES INC. 431 GREENWICH ST., N. Y. 13, N. Y., U.S.A.

SINGING SOUNDS BETTER WHEN THERE'S AN ASTATIC MICROPHONE ABOUT

How to keep your profits from going to the "dogs"!

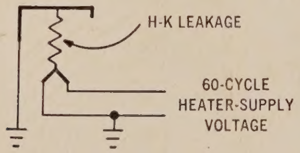
Another way
RCA helps you
improve your
business.

STOP PROFIT LEAKS!

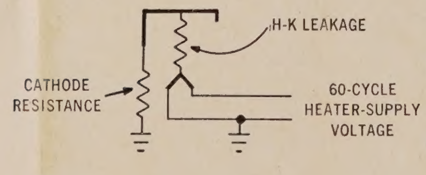
Review these important facts about heater-cathode leakage

Did that TV set come back? Same symptoms—60-cycle hum bars? You diagnosed the trouble correctly—a leaky tube.

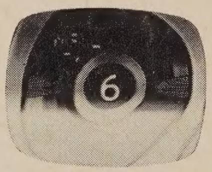
Here's why a leaky tube can cause *you* a lot of trouble.


H-K LEAKAGE
60-CYCLE HEATER-SUPPLY VOLTAGE

H-K leakage provides a path for 60-cycle current to flow from the heater to the cathode. If there is no resistance or impedance in the cathode circuit, this leakage current usually causes no difficulty.

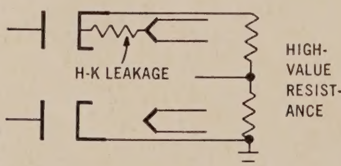

H-K LEAKAGE
CATHODE RESISTANCE
60-CYCLE HEATER-SUPPLY VOLTAGE

When there is resistance in the cathode circuit, the H-K leakage current develops a 60-cycle voltage across the cathode resistor. This voltage may produce visible and/or audible 60-cycle "hum".

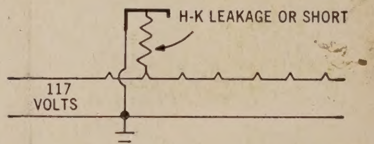


H-K leakage in the RF, IF, or video stages of a TV receiver can produce 60-cycle horizontal pulling and "hum" bars.

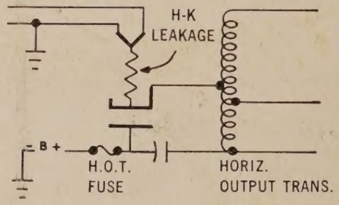
H-K leakage in the sync-separator tube or in the horizontal AFC, oscillator, or output tubes can produce 60-cycle horizontal pulling without "hum" bars.


H-K LEAKAGE
HIGH-VALUE RESISTANCE

In detector, discriminator, and AFC stages, which usually have relatively high values of resistance in the cathode circuit, even a slight amount of H-K leakage current can easily cause visible and/or audible 60-cycle "hum" symptoms.


H-K LEAKAGE OR SHORT
117 VOLTS

An H-K short circuit, or low-resistance leakage, in a series-string tube, short-circuits part of the heater circuit. The resulting higher voltage across the remaining heaters may cause heater burnout.


H-K LEAKAGE
B+
H.O.T. FUSE
HORIZ. OUTPUT TRANS.

H-K leakage in a damper tube which has its heater grounded may cause the H.O.T. fuse to blow.

RCA tubes help you beat these problems—drastically reduce heater-cathode leakage and shorts through such improvements as precise control of heater coatings to eliminate "thin spots"...better heater stem lead arrangements...new cathode materials and structures. Avoid callbacks caused by tubes that develop H-K leakage problems and keep your profits from "leaking" too. Remember to always ask your distributor for *RCA TUBES!*

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